Karlsruher Institut für Technologie

Module Handbook
Bioengineering Bachelor 2023 (Bachelor of Science (B.Sc.))

SPO 2023

Winter term 2023/24

Date: 20/09/2023

KIT DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING

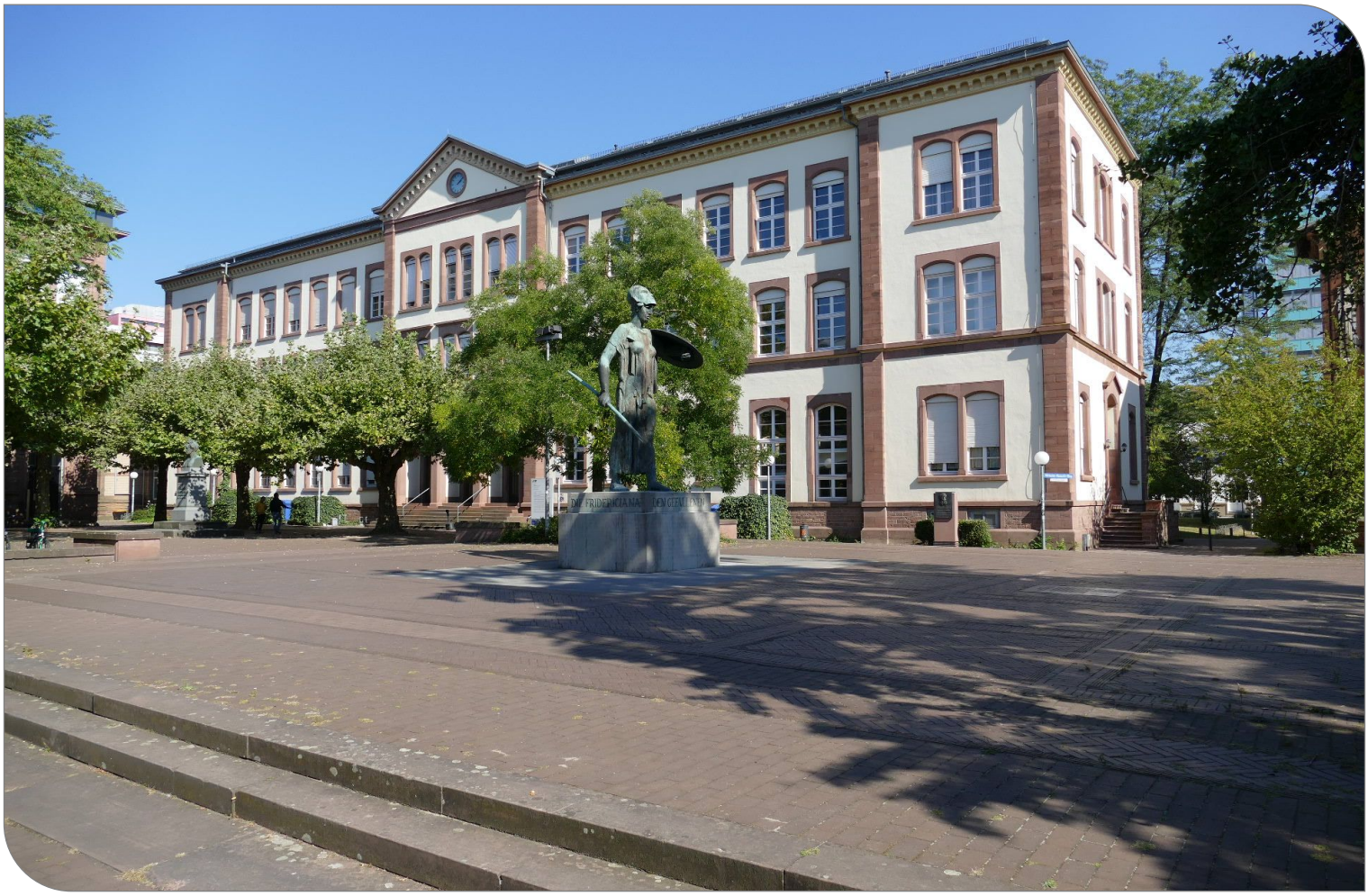

Table Of Contents

1 General Information

Field of study	**Bioengineering**
Faculty	KIT Department of Chemical and Process Engineering
Academic degree	Bachelor of Science (B.Sc.)
Exam regulations	Version 2023
Regular termin	6 Semester
Credit points	180
Language	German
Grade scale	Tenth grades
Calculation scheme	Weighted average by credits; the bachelor thesis is weighted twice

1.1 Qualification Profile Bachelor Bioengineering

The focus of bioengineering is on process engineering in the context of an industrial, engineering-driven application of biological and biotechnological principles. In this way, bioengineering differs from natural sciences programs, biotechnology or molecular biotechnology, which deal primarily with the utilization of biological principles. Bioengineers make a crucial contribution to the development of interdisciplinary approaches for creating an energetically and materially sustainable, post-fossil economy.

The Bachelor’s program provides knowledge on scientific fundamentals and methodical expertise in the area of bioengineering. The Bachelor’s degree will qualify students to apply the acquired theoretical knowledge to a specific professional field. Furthermore, students will gain the knowledge and skills that are necessary to complete a Master's program successfully.

The compulsory program in the first and second year focuses on methodical and qualified fundamental knowledge of mathematics, natural sciences, biotechnology and engineering. The main focus is on process engineering of biological material systems, reactions and processes in theory (basic lectures) and practice (introductory laboratory courses).

The knowledge acquired in the first and second year is not only the basis for the third year of the Bachelor’s program, but also for the following Master’s studies. Mandatory elective courses in the third year of study offer the opportunity to gain in-depth knowledge in a specialist area for the first time. These mandatory elective courses comprise technological aspects and a practical project work (group work). Within their Bachelor's thesis, students prove the ability of working on specialized problems independently and within a defined time frame using scientific methods.

Graduates are qualified to identify, abstract, and solve technical problems using the basic knowledge provided during the Bachelor’s program. Furthermore, they can evaluate biotechnological products and processes systematically as well as select and apply analyzing and simulation tools. They are able to combine theory and practice as well as to organize and implement projects independently. Graduates are able to collaborate with experts in other fields.

1.2 Contact

Dean of students	Prof. Dr.-Ing. Achim Dittler
Study affairs/ study counseling	Dr.-Ing. Barbara Freudig
Master Examination Board	Prof. Dr.-Ing. Achim Dittler
Examination office	Julia Hofer

Current information on degree programs and dates for information sessions can be found on the faculty web pages.

http://www.ciw.kit.edu/english/studium.php

1.3 Exam Regulations

The legal basis for the study program and the examinations is the "Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Bioingenieurwesen" (Study and Examination Regulations of the Karlsruhe Institute of Technology (KIT) for the Bachelor Course of Studies in Bioengineering) of 27 April 2023.

The statute statute can be found in the appendix of this module manual (only in German).

1.4 Recognition of achievements according to § 19 SPO

A request for recognition of services which

- At another university
- Abroad
- Outside the higher education system

can be submitted to the Bachelor Examination Board within one semester. There, if necessary after consultation with the subject representative, it will be determined whether the performance is equivalent to a performance envisaged in the curriculum of the course of study and can be recognised. Achievements completed as part of a semester abroad can also be recognized at a later date.

For forms, please refer to the website of the KIT Faculty of Chemical and Process Engineering https://www.ciw.kit.edu/bpa.php

1.5 Additional achievements and interdisciplinary (soft skill) qualification

Additional credits and interdisciplinary qualifications cannot always be registered directly in the CAS system (e.g. some modules from another faculty). In any case, you must contact Julia Hofer before the examination.

Exception: Interdisciplinary qualification at the House of Competence (HoC) or Language Centre

If the Soft Skill Qualification is taken at the HoC or Language Centre, then no certificate of approval is required for an examination achievement, as the achievements are automatically posted in the CAS system under "unallocated credits".

If you want to credit a performance that is listed under " unallocated credits", you have submit a form to the Masters Examination Board.

For forms, please refer to the website of the KIT Faculty of Chemical and Process Engineering https://www.ciw.kit.edu/bpa.php

2 Curriculum

2.1 Semester overview

Semester CP	Fundamentals of Mathematics and Natural Sciences	Fundamentals of Scientific Engineering	Fundamentals of Process Engineering	Specialization/ Process Engineering	Specialization/ Project Work; Interdicliplinary Qualification; Thesis
1 **29**	Advanced Mathematics I (7) General Chemistry and Chemistry of Aqueous Solutions (6) Biology für Engineers (7) - Cell Biology - Biochemistry - Mikrobiology Basic Pracital Course (4) - Generyl Chemistry - Mikrobiology	Engineering Mechanics: Statics (5)			
2 **33**	Advanced Mathematics II (7) Mathematical Modeling for Biochemical Engineering (4) Organic Chemistry (5) Biology für Engineers (2) - Genetics	Design of Machines (7)	Introduction into Bioengineering (5)		Programming and Numeric Simulation Using MATLAB (3)
3 **29**	Advanced Mathematics III (7) Data Analysis (3)	Engineering Mechanics: Dynamics (5) Thermodynamics I (7)	Bioprocess Engineering (5)		Scientific Writing with LaTeX (2)
4 **33**		Thermodynamics II (7) Heat and Mass Transfer (7) Fluiddynamics (5) Control Engineering and System Dynamics (5)		Elective Module Bioprocess Engineering (including lab) I (9)	
5 **28**			Unit Operations: Two modules (2 X 6)	Elective Module Bioprocess Engineering (including lab) (9) Elective Module Process Engineering I (5)	Specialization/ Project Work (2)
6 **28**				Elective Module Process Engineering II (5)	Specialization/ Project Work (10) Interdiciplinary Qualification (1) Thesis (12)

Numbers in brackets: Credits Points (CP)

Elective Module Bioprocess Engineering I and II: Lecture/ written exam (6 LP), lab one week (3 LP), the following modules can be chosen:

- Intensification of Bioprocesses
- Food Bioprocess Engineering
- Biopharmaceutical Process Engineering
- Microsystems in Bioprocess Engineering

2.2 Overview: Fields and Modules

Area	Module	Responsible	SWS	CP
Fundamentals of Mathematics and Natural Sciences 52 CP	Advanced Mathematics I	Griesmaier	6	7
	Advanced Mathematics II	Griesmaier	6	7
	Advanced Mathematics III	Griesmaier	6	7
	Mathematical Modeling for Biochemical Engineering	Thäter	2	4
	Data Analysis	Guthausen	2	3
	General Chemistry/ Chemistry of Aq. Solutions	Horn	5	6
	Organic Chemistry	Meier	4	5
	Biology for Engineers	Holtmann	8	9
	Basic Practical Course	Abbt-Braun, Horn, Neumann	2	4
Fundamentals of Scientific Engineering 48 CP	Engineering Mechanics: Statics	Willenbacher	4	5
	Engineering Mechanics: Dynamics	Dittmeyer	4	5
	Design of Machines	Nirschl	6	7
	Control Engineering and System Dynamics	Meurer	4	5
	Thermodynamics I	Enders	5	7
	Thermodynamics II	Enders	5	7
	Fluiddynamics	Nirschl	4	5
	Heat and Mass Transfer	Wetzel	5	7
Fundamentals of Process Engineering 22 LP	Introduction into Bioengineering	Grünberger	4	5
	Bioprocess Engineering	Grünberger	4	5
	Two oft he following modules:			
	- Mechanical Processing	Dittler	4	6
	- Thermal Process Engineering	Kind	4	6
	- Chemical Process Engineering	Wehinger	4	6
Specialization/ Process Engineering 28 LP	Elective Module Bioprocess Engineering I		4 + P	9
	Elective Module Bioprocess Engineering II		4 + P	9
	Elective Module Process Engineering I		4	5 (6)
	Elective Module Process Engineering I		4	5 (4)
Interdicliplinary Qualification 6 LP	Programming and Numeric Simulation Using MATLAB	Meurer	2	3
	Scientific Writing with LaTeX			2
	Elective module			1
Specialization/ Project Work 12 LP	1 module			12
12 LP	Thesis			12
Total				180

CP: Credit Points (ECTS), SWS: weekly teaching hours

2.3 Lectures/ Exercises/ Laboratories/ exams

(Semester Overview, Attendance Timehours per week)

	1. Semester (WS)					2. Semester (SS)				
	V	Ü	P	LP	E	V	Ü	P	LP	E
Advanced Mathematics I and II	4	2	-	7	S+K	4	2	-	7	S+K
Mathematical Modeling for Biochemical Engineering	-	-	-	-	-	2	1		4	A
Engineering Mechanics: Statics	2	2	-	5	K	-	-	-	-	-
Design of Machines	-	-	-	-	-	3	2	-	7	S+K
General Chemistry and Chemistry in Aqu. Solutions	3	2	-	6	K		-	-	-	-
Organic Chemistry	-	-	-	-	-	2	2	-	5	K
Biology for Engineers – Cell Biology	2	-	-	2	K	-	-	-	-	-
Biology for Engineers - Biochemistry	2	-	-	2,5	K	-	-	-	-	-
Biology for Engineers - Mikrobiology	2	-	-	2,5	K	-	-	-	-	-
Biology for Engineers – Genetcs	-	-	-	-	-	2	-	-	2	K
Introduction into Bioengineering	-	-	-	-	-	2	2	-	5	K
Basic Practical Course in Natural Sciences	-	-	2	4	S	-	-	-	-	-
Programming and Numeric Simulation Using MATLAB	-	-	-	-	-	1	1	-	3	S
Total credit points/ Number of graded exams				29	6				33	6

	3. Semester (WS)					4. Semester (SS)				
	V	Ü	P	LP	E	V	Ü	P	LP	E
Advanced Mathematics III	4	2	-	7	S+K	-	-	-	-	-
Data Analysis	1	1	-	3	A	-	-		-	-
Engineering Mechanics: Dynamics	2	2	-	5	S+K	-	-	-	-	-
Control Engineering and System Dynamics	-	-	-	-	-	2	2	-	5	K
Fluiddynamics	-	-	-	-	-	2	2	-	5	S+K
Thermodynamics I and II	3	2	-	7	S+K	3	2	-	7	S+K
Heat and Mass Transfer	-	-	-	-	-	3	2	-	7	K
Bioprocess Engineering	2	2	-	5	K	-	-	-	-	-
Elective Module Bioprocess Engineering I	-	-	-	-	-	2	2	2	9	K+P
Scientific Writing with LaTeX	1	1	-	2	S					
Total credit points/ Number of graded exams				29	5				33	6

	5. Semester (WS)					6. Semester (SS)				
	V	Ü	P	LP	E	V	Ü	P	LP	E
Chemical/ Thermal/ Mechanical Process Engineering	2	2	-	6	K	-	-	-	-	-
Chemical/ Thermal/ Mechanical Process Engineering	2	2	-	6	K	-	-		-	-
Eletive Module Bioprocess Engineering II	2	2	2	9	K+P	-	-	-	-	-
Elective Module Process Engineering	2	2	-	5	K	2	2	-	5	K
Specialized Subject/ Project Work	1	1	-	2	-	1	1	P	10	A+M
Interdisciplinary Qualification	-	-	-	-	-	1	-	-	1	S
Thesis	-	-	-	-	-	360 Stunden			12	A
Total credit points/ Number of graded exams				28	5				28	4

WS: Winter term
SS: Summer term
V: Lecture
Ü: Exercies
P: Lab
CP: Credit Points (ECTS)
E: Exam
K: Written Exam
M: Oral Exam
A: Examination of another type/ thesis
S: Completed Courswork (ungraded)

3 Field of study structure

Mandatory	
Orientation Exam *This field will not influence the calculated grade of its parent.*	
Bachelor's Thesis	12 CR
Fundamentals of Mathematics and Natural Sciences	52 CR
Fundamentals of Scientific Engineering	48 CR
Fundamentals of Process Engineering	22 CR
Specialization/ Process Engineering	28 CR
Specialization/ Project Work	12 CR
Interdisciplinary Qualifications	6 CR
Voluntary	
Additional Examinations *This field will not influence the calculated grade of its parent.*	
Master's Transfer Account *This field will not influence the calculated grade of its parent.*	

3.1 Orientation Exam

Mandatory		
M-CIWVT-106447	Orientation Exam	0 CR

3.2 Bachelor's Thesis

Credits
12

Prerequisite:

The Bachelor thesis may only be started when the requirements (at least 120 LP) have been fulfilled.

Procedure for registering the Bachelor's thesis

Registration for the Bachelor's thesis is handled by the Bachelor Examination Board:

- Registration before starting the thesis
- If possible, send documents to the Bachelor Examination Board via the Institute Secretariat.
- The Bachelor Examination Board requires the following documents no later than four weeks after the start of the work
  - Admission certificate https://www.ciw.kit.edu/1838.php filled out and signed
  - Copy of the assignment (signed by the person submitting the assignment)
- The Bachelor Examination Board will record and register the Bachelor thesis in the campus management system. The deadline for submission is also recorded by the Bachelor Examination Board.

Submission of the Bachelor's thesis:

- The maximum processing time is four months. The submission deadline is recorded in the campus management system. The thesis must be handed in within the deadline.
- When submitting the Bachelor's thesis, students must declare that they have written the thesis independently and have not used any sources or aids other than those specified. The exact wording can be found in the study and examination regulations.
  - pdf-File, upload
  - Handing in at the supervisor after consultation
- The date of submission is the date of upload.

Mandatory		
M-CIWVT-106580	Module Bachelor's Thesis	12 CR

3.3 Fundamentals of Mathematics and Natural Sciences

Credits
52

Mandatory		
M-MATH-100280	Advanced Mathematics I	7 CR
M-CIWVT-106414	Biology for Engineers	9 CR
M-CIWVT-106431	General Chemistry and Chemistry of Aqueous Solutions	6 CR
M-CIWVT-106427	Basic Practical Course in Natural Sciences	4 CR
M-MATH-106443	Mathematical Modeling for Biochemical Engineering	4 CR
M-MATH-100281	Advanced Mathematics II	7 CR
M-CHEMBIO-101115	Organic Chemistry for Engineers	5 CR
M-MATH-100282	Advanced Mathematics III	7 CR
M-CIWVT-106432	Data Analysis	3 CR

3.4 Fundamentals of Scientific Engineering

Credits
48

Mandatory		
M-CIWVT-105846	Engineering Mechanics: Statics	5 CR
M-CIWVT-101128	Engineering Mechanics: Dynamics	5 CR
M-CIWVT-101941	Design of Machines	7 CR
M-CIWVT-101129	Thermodynamics I	7 CR
M-CIWVT-106308	Control Engineering and System Dynamics	5 CR
M-CIWVT-101130	Thermodynamics II	7 CR
M-CIWVT-101131	Fluiddynamics	5 CR
M-CIWVT-101132	Fundamentals of Heat and Mass Transfer	7 CR

3.5 Fundamentals of Process Engineering

Credits
22

Mandatory		
M-CIWVT-106433	Introduction into Bioengineering	5 CR
M-CIWVT-106434	Bioprocess Engineering	5 CR
Unit Operations (Election: 12 credits)		
M-CIWVT-101134	Thermal Process Engineering	6 CR
M-CIWVT-101135	Mechanical Processing	6 CR
M-CIWVT-101133	Chemical Process Engineering	6 CR

3.6 Specialization/ Process Engineering

Credits
28

Specialization Bioprocess Engineering (Election: 18 credits)		
M-CIWVT-106437	Biopharmaceutical Process Engineering	9 CR
M-CIWVT-106416	Intensification of Bioprocesses	9 CR
M-CIWVT-106436	Food Bioprocess Engineering	9 CR
Specialization Process Engineering (Election: at least 10 credits)		
M-CIWVT-106475	Biopharmaceutical Process Engineering	6 CR
M-CIWVT-101136	Energy Process Engineering	5 CR
M-CIWVT-106444	Intensification of Bioprocesses	6 CR
M-CIWVT-106476	Food Bioprocess Engineering	6 CR
M-CIWVT-101137	Industrial Organic Chemistry	5 CR

3.7 Specialization/ Project Work

Credits
12

In the fifth semester the possibility of profile building exists for the first time. Eleven specialization subjects are available. The size and structure of these specialization subjects are similar. All specialization subjects extend over two semesters, start in the winter semester and end at the end of May at the latest. In the winter semester, lectures usually take place in which extended, subject-specific knowledge is imparted. Subsequently, research-related project work is carried out in small groups. Prerequisites for participation in the profile subjects are at least 60 ECTS and at least one successfully completed internship (e.g. general and inorganic chemistry, process engineering,...).

The learning control of specialization subjects consists of two parts which are listed in the description of the module description (e.g. oral examination and presentation of the project work). The specialization subject is only passed if both partial examinations are passed (evaluated with at least "sufficient"). A failed partial performance can only be repeated once. Dates for repeat exams will be agreed with the person responsible for the subject.

As the practical work is carried out in the laboratory, the number of participants in the individual specialization subjects is limited. The registration for the specialization subjects is usually possible in June or July. Within a registration period of two weeks, students have the opportunity to choose their preferred subject (at least one first and one second wish). After the registration deadline, the places will be allocated automatically, taking into account your wishes as far as possible.

Before the start of the registration period, an information event will be held in which the individual subjects will be presented and the registration procedure explained.

Election regulations
Elections in this field require confirmation.

Specialization/ Project Work (Election: 1 item)		
M-CIWVT-106477	Automation and Control Systems Engineering	12 CR
M-CIWVT-101143	Biotechnology	12 CR
M-CIWVT-101145	Energy and Environmental Engineering	12 CR
M-CIWVT-104457	Fundamentals of Refrigeration	12 CR
M-CIWVT-105995	Circular Economy	12 CR
M-CIWVT-101148	Food Technology	12 CR
M-CIWVT-106448	Air Pollution Control	12 CR
M-CIWVT-101147	Mechanical Separation Technology	12 CR
M-CIWVT-101154	Micro Process Engineering	12 CR
M-CIWVT-101153	Process Development and Scale-up	12 CR

3.8 Interdisciplinary Qualifications

Credits
6

A total of 6 LPs must be completed in the area of "soft skill qualifications" during the Bachelor's programe. Non-technical modules, such as modules from other subject areas, language courses or other courses offered by the House of Competence (HoC) or the Centre for Applied Cultural Studies and General Studies (ZaK), belong to interdisciplinary qualifications.

Mandatory		
M-CIWVT-106438	Programming and Numeric Simulation Using MATLAB	3 CR
M-HOC-106502	Scientific Writing with LaTeX	2 CR

3.9 Additional Examinations

Additional Examinations (Election: at most 30 credits)		
M-CIWVT-102017	Further Examinations	30 CR
M-ZAK-106099	Supplementary Studies on Sustainable Development	19 CR
M-ZAK-106235	Supplementary Studies on Culture and Society	22 CR

3.10 Master's Transfer Account

Students who have already earned at least 120 LP in their Bachelor's programe can earn credit points from a consecutive Master's programe at KIT up to a maximum of 30 LP.

Exams can be taken in the following subjects:

- Advanced Fundamentals
- Internship
- Soft Skill Qualifications

Further information on individual modules can be found in the module manual of the Master's program.

Within the first Master's semester, achievements can be taken over into the master program. Please contact the Master's Examination Board.
There is no obligation to transfer achievements form Master Transfer Account!

Election notes
Please note: Upon successful completion of all studies and exams needed for the bachelor's degree, a control of success registered as a prior master's examination may only be passed as long as you are enrolled in the bachelor's program. You should not yet have been admitted to the master's program and the master's semester should not yet have started.

This means that as soon as your admission to the master's program has been expressed and the master's semester has started, your participation in the examination is the **first regular examination** attempt within the framework of your master's studies.

Master Transfer Account (Election: at most 30 credits)		
M-CIWVT-101991	Single Results	30 CR

Modelled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 120 credits in your course of studies.

4 Modules

M 4.1 Module: Automation and Control Systems Engineering [M-CIWVT-106477]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	1

Mandatory			
T-CIWVT-113088	Automation and Control Systems Engineering - Exam	6 CR	Meurer
T-CIWVT-113089	Automation and Control Systems Engineering - Project Work	6 CR	Meurer

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

M 4.2 Module: Advanced Mathematics I [M-MATH-100280]

Responsible: Prof. Dr. Roland Griesmaier
Organisation: KIT Department of Mathematics
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Duration	Language	Level	Version
7	Grade to a tenth	1 term	German	3	3

Mandatory			
T-MATH-100275	Advanced Mathematics I	7 CR	Arens, Griesmaier, Hettlich
T-MATH-100525	Tutorial Advanced Mathematics I *This item will not influence the grade calculation of this parent.*	0 CR	Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried by a written examination of length 120 minutes and by homework assignments (pre-requesite). A "pass" result on the pre-requesite is a requirement for registration for the corresponding written examination.

Prerequisites
none

Competence Goal
The students know the fundamentals of one-dimensional calculus. They can reliably use limits, functions, power series and integrals. They understand central concepts such as continuity, differentiability or integrability and they know important statements about these concepts. The students can follow the arguments leading to these statements as presented in the lectures and are able to independently prove simple assertions based on these statements.

Content
Fundamentals, sequences and convergence, functions and continuity, series, differential calculus of one real variable, integral calculus

Module grade calculation
The module grade is the grade of the written examination

Workload
In class: 90 hours

- lectures, tutorials and examinations

Independent study: 120 hours

- independent review of course material
- work on homework assignments
- preparation for written exams

Literature
will be announced in class.

Base for
Advanced Mathematics II

M 4.3 Module: Advanced Mathematics II [M-MATH-100281]

Responsible: Prof. Dr. Roland Griesmaier
Organisation: KIT Department of Mathematics
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each summer term	1 term	German	3	2

Mandatory			
T-MATH-100276	Advanced Mathematics II	7 CR	Arens, Griesmaier, Hettlich
T-MATH-100526	Tutorial Advanced Mathematics II *This item will not influence the grade calculation of this parent.*	0 CR	Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried by a written examination of length 120 minutes and by homework assignments (pre-requesite). A "pass" result on the pre-requesite is a requirement for registration for the corresponding written examination.

Prerequisites
none

Competence Goal
The students know about the fundamentals of linear algebra. The are able to use vectors, linear maps and matrices without problems. They have basic knowledge about Fourier series. The students also can theoretically and practically deal with initial value problems of ordinary differential equations. They can make use of classical solution techniques for linear differential equations.

Content
vector spaces, linear maps, eigenvalues, Fourier series, differential equations, Laplace transform

Module grade calculation
The module grade is the grade of the written examination.

Workload
In class: 90 hours

- lectures, tutorials and examinations

Independent study: 120 hours

- independent review of course material
- work on homework assignments
- preparation for written exams

Recommendation
The following modules should have been taken: Advanced Mathematics 1

Literature
will be announced in class.

Base for
Advanced Mathematics III

M 4.4 Module: Advanced Mathematics III [M-MATH-100282]

Responsible: Prof. Dr. Roland Griesmaier
Organisation: KIT Department of Mathematics
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each winter term	1 term	German	3	2

Mandatory			
T-MATH-100277	Advanced Mathematics III	7 CR	Arens, Griesmaier, Hettlich
T-MATH-100527	Tutorial Advanced Mathematics III *This item will not influence the grade calculation of this parent.*	0 CR	Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried by a written examination of length 120 minutes and by homework assignments (pre-requesite). A "pass" result on the pre-requesite is a requirement for registration for the corresponding written examination.

Prerequisites
none

Competence Goal
The students know about differential calculus for vector-valued functions of several variables and about techniques of vector calculus such as the definition and application of differential operators, the computation of domain, line and surface integrals and important integral theorems. They have basic knowledge about partial differential equations and know basic facts from stochastics.

Content
Multidimensional calculus, domain integrals, vector calculus, partial differential equations, stochastics.

Module grade calculation
The module grade is the grade of the written examination.

Workload
In class: 90 hours

- lectures, tutorials and examinations

Independent study: 120 hours

- independent review of course material
- work on homework assignments
- preparation for written exams

Recommendation
The following modules should have been taken before: Advanced Mathematics I and II

Literature
will be announced in class.

M 4.5 Module: Air Pollution Control [M-CIWVT-106448]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	1

Mandatory			
T-CIWVT-113046	Air Pollution Control	7 CR	Dittler
T-CIWVT-113047	Air Pollution Control - Project Work	5 CR	Dittler

Competence Certificate
The learning control consists of two partial achievements:

1. oral examination, duration 30 minutes
2. project work

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
Students undertstand transport behavior and methods of size distribution measurement of airborne fine particles in the context of environmental and nanotechnology. They are able to apply this knowledge to solve basic problems of particle technology in a team oriented approach.

Content
The classes provide a knowledge base of methods of particle dispersion, particle transport processes in gases, as well as methods for their characterization with applications in the environment and industrial product design. Practical experience related to these concepts is developed in a team based lab project.

Module grade calculation
The module grade is calculated from the grades of the two partial achievments:
40 % project work, 60 % oral examination.

Workload

- Attendance time: 56 h (V+Ü) + 120 (project work) + 10 (Excoursion)
- Self-Study: 24 h
- Oral examination: 140 h

Literature
Skriptum Gas-Partikel-Messtechnik

M 4.6 Module: Basic Practical Course in Natural Sciences [M-CIWVT-106427]

Responsible: Dr. Gudrun Abbt-Braun
Prof. Dr. Harald Horn
Dr. Anke Neumann

Organisation: KIT Department of Chemical and Process Engineering

Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
4	pass/fail	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-113015	Laboratory Work: General Chemistry	2 CR	Abbt-Braun, Horn
T-CIWVT-113014	Laboratory Work: Microbiology for Engineers	2 CR	Neumann

Competence Certificate
The learning control consists of two partial achievements:

1. Laboratory Work: General Chemistry; ungraded coursework

2. Laboratory Work: Microbiology for Engineers; ungraded coursework

Module grade calculation
Ungraded

Annotation
Participation in the safety briefing is mandatory.

Workload
General Chemistry:
Attendance time: 5 experiments/ 20 hrs
Self-study: 40 hrs

Microbiology:
Attendance time: one week/ 40 hrs
Self-study: 20 hrs

Literature

- BAST: Mikrobiologische Methoden Steinbüchel/Oppermann-Sanio: Mikrobiologisches Praktikum
- Schweda, E.: Jander/Blasius - Anorganische Chemie I+II. Hirzel Verlag, Suttgart, 19. bzw. 18. Auflage, 2022
- Praktikumsskript Coursework "Allgemeine Chemie," provided in ILIAS.

M 4.7 Module: Biology for Engineers (BIW-TEBI-01) [M-CIWVT-106414]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
9	Grade to a tenth	Each winter term	2 terms	German	3	1

Mandatory			
T-CIWVT-111063	Genetics	2 CR	Neumann
T-CIWVT-112997	Biochemistry	2,5 CR	Holtmann
T-CIWVT-113037	Cell Biology	2 CR	Gottwald
T-CIWVT-113038	Microbiology	2,5 CR	Neumann

Competence Certificate
The module is successfully completed by

- a written exam "Cell Biology" of 90 min
- a written exam "Genetics" of 90 min
- a written exam "Biochemistry" of 90 min
- a written exam "Microbiology" of 90 min

Prerequisites
None

Competence Goal
Cell-biology: Identification of pro- and eukaroytic cells, identification of pro- and eukaroytic cellular constituents, knowledge of basic metabolic pathways, knowledge of the most important molecule classes und their occurence, ability to operate a light microscope and knowledge of the underlying theory, being able to select bioreactors according to the application.

Genetics: Students are able to give a detailed description of basic aspects of molecular genetics in pro- and eukaryotes and can explain genetic processes in their own words. Basic aspects are in particular: Structure and organization of nucleic acids, mechansims of replication, transcription, translation, regulation of gene expression, recombination, transposition, DNA repair mechanisms and genetic basics of virology. Furthermore, students are able to apply their basic knowledge by explaining graphics or by transfering their knowlegde to gene technological methods.

Biochemistry: Students will be able to describe the different groups of biomolecules. In addition to the importance of water for cell metabolism and the basics of bioenergetics, they can explain the structure of carbohydrates, lipids, amino acids, peptides, proteins and nucleic acids and their importance for the living cell. You will be able to describe in detail anabolism and catabolism in primary metabolism including the basic regulatory principles. They can interpret the sequences of biochemical processes also from an energetic point of view. They can explain photosynthesis. You will be able to clarify the basic processes of protein biosynthesis.

Microbiology: Students will be able to describe the subfields of microbiology. They can explain the structure and morphology of prokaryotic and eukaryotic microorganisms and their classification in the phylogenetic system. They can describe microbial primary metabolism and explain the differences between aerobic and anaerobic respiration and fermentation processes. They will be able to clarify lithotrophy and the utilization of inorganic electron donors. They can explain the role of microorganisms in the environment and global material cycles. They can interpret the sequences of microbial processes in biotechnology.

Content
Cell biology: Microscopy; Cell structure of pro- and eukaryotes; Eukaryotic cell compartiments; Structure and function of macromolecules; Communication between cells; Cell cycle.

Genetics: Nucleic acids; Chromatin and chromosomes; Genes and genomes; Replication; Transcription; Translation; Recombination; Mutations and DNA repair mechanisms; Gene regulation; Methods and applications of molecular gene technology.

Biochemistry: structure and function of biomolecules; Introduction to primary metabolism; Bioenergetics & regulatory principles; Amino acids and peptides; Protein structure and function; Enzymes, Coenzymes and vitamins; Carbohydrates; Glycolysis and Gluconeogenesis; Citrate cycle and respiratory chain; Photosynthesis; Lipids and membranes; Protein metabolism

Microbiology: History and sub-fields of microbiology; morphology and structure of prokaryotes and eukaryotes ; Microbiological methods; Classification and structure of phylogenetic system; Growth of unicellular microorganisms; Fundamentals of microbial primary metabolism; Anaerobic respiration processes and microbial fermentations; Lithotrophy & utilization of inorganic electron donors; Microbial metabolism; Microbial evolution; Microbial ecology and global material cycles; Fundamentals of microbial biotechnology and environmental microbiology

Module grade calculation
The module grade is calculated from the LP-weighted average of the four parts of the module.

Workload
Attendance time:

- Winter Semester Lecture of 4 SWS: 60 hrs
- Summer Semester lecture of 4 SWS: 60 hrs

Homework

- Self-study time: 70 hrs
- Exam preparation: 80 h (each part about 20 hrs)

Recommendation
None

Literature
Zellbiologie:

- Alberts: Lehrbuch Molekulare Zellbiologie (Wiley-VCH)
- Munk: Biochemie - Zellbiologie (Thieme)
- Plattner/Hentschel: Zellbiologie (Thieme)

Genetik:

- Munk: Taschenlehrbuch Biologie, Genetik (Thieme)
- Knippers: Genetik (Thieme)

Biochemie:

- Voet/Voet/Pratt: Lehrbuch der Biochemie (Wiley-VCH)
- Koolman/Röhm: Taschenatlas der Biochemie (Thieme)
- Stryer: Biochemie (SpringerSpektrum)

Mikrobiologie:

- Munk: Taschenlehrbuch Mikrobiologie (Thieme)
- Cypionka: Grundlagen der Mikrobiologie (Springer)

M 4.8 Module: Biopharmaceutical Process Engineering (BIW-MAB-02) [M-CIWVT-106475]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Process Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-CIWVT-113023	Biopharmaceutical Process Engineering	6 CR	Hubbuch

Competence Certificate
Learning controlis a written examination of 120 min duration.

Prerequisites
None

Competence Goal
Overview on unit operations for protein separations and respective analytics used in the biotechnological industry.

Content
The elcture series adresses fundamentals in biotechnological purification of bio-products and respective analytics.

Module grade calculation
The module grade ist the grade of the written exam.

Workload

- Lectures and exercises: 60 hrs
- Homework: 80 hrs
- preparation of examination: 40 hrs

Literature
will be announced

M 4.9 Module: Biopharmaceutical Process Engineering (BIW-MAB-02) [M-CIWVT-106437]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Bioprocess Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
9	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-CIWVT-113023	Biopharmaceutical Process Engineering	6 CR	Hubbuch
T-CIWVT-113024	Laboratory Work: Downstream Processing	3 CR	Hubbuch

Competence Certificate
Learning control constist of

- written examination of 120 min duration
- Lab work

Prerequisites
None

Competence Goal
Overview on unit operations for protein separations and respective analytics used in the biotechnological industry.

Content
The elcture series adresses fundamentals in biotechnological purification of bio-products and respective analytics.

Lab:

Methods for the purification of proteins, which are based on solubility of proteins as well as on interactions between proteins and carrier materials. Sampling and sample preparation; protein characterisation; analytical methods for the determination of product concentrations; determination and calculation of the various process parameters; graphical representation and interpretation of the results; linearisation procedures; computer-aided process modelling and optimisation.

Module grade calculation
ECTS-weighet mean of written examination and lab work.

Workload
Lectures and exercises: 60 h
Homework: 80 h
preparation of examination: 40 h

Lab Work (one week):

Attendance time: 40 h
preparation and reports: 50 h

Literature
will be announced

M 4.10 Module: Bioprocess Engineering [M-CIWVT-106434]

Responsible: Prof. Dr.-Ing. Alexander Grünberger
Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Process Engineering (mandatory)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-113019	Bioprocess Engineering	5 CR	Grünberger, Hubbuch

Prerequisites
None

Workload

- Lectures: 60 h
- Homework: 60 h
- Exam Preparation: 30 h

M 4.11 Module: Biotechnology (CIW-MAB-05) [M-CIWVT-101143]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	3

Mandatory			
T-CIWVT-103669	Biotechnology	9 CR	Perner-Nochta
T-CIWVT-113097	Biotechnology - Seminar	3 CR	Perner-Nochta

Competence Certificate
The learning control consists of two partial achievements:

1. Seminar (presentation, hand-out)
2. practical work

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
Basic understanding of processes and process syntheses in biotechnological production

proseminar „Biotechnology:
After successful completion of the seminar, the students are familiar with different fields of research in biotechnology and have gained initial experience in presenting and writing texts.

Lecture „Management of scientific projects“ and exercises:
The students are able to conduct literature research on their own, design own experiments, evaluate their own data, write own scientific texts. They can plan their own small project regarding time and finances required and prepare a project plan as well as present it. They are enabled to prepare a scientific poster and present it.

Hands-on training:
The students are able to do own scientific research and practical work in the field of biotechnology. They know how to analyse their own gained data and prepare a project report.

Content
Proseminar Biotechnology:
In this proseminar, texts such as publications and book articles from various application areas and research fields of biotechnology are discussed in depth. Texts on methods and their areas of application can also be used. Through careful reading, appropriate presentation (introduction, explanation, classification) as well as extensive discussion, the students should introduce each other to relevant areas of biotechnology.

Lecture „Management of scientific projects“ and exercises:
The lecture covers literature research, design of experiments, data evaluation, scientific writing and project management; in parts it is software-based and carried out in an electronic classroom.

Practical exercises cover literature research, preparation of a project plan, presentation of the project plan, preparation of a poster, presentation of the poster

Hands-on training:
Accomplishment of autonomous investigation and practical work in the field of biotechnology, preparation of a project report

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Proseminar Biotechnology (3 ECTS):

- Attendance time: 45 hrs
- Compulsory attendance for more than 80% of the lectures
- Preparation and wrap-up seminar: 15 hrs
- Self-study: 30 hrs

Management of scientific projects:

- Lectures and Exercises: 30 hrs
- Preparation and wrap-up lectures: 30 hrs
- Self-study: 30 hrs

Lab work:

- Lab: 80 h
- Preparation and wrap-up: 10 hrs

Project work:

- Lab: 10 h
- Preparation and wrap-up: 80 hrs

Literature
Will be announced.

M 4.12 Module: Chemical Process Engineering (CIW-CVT-01) [M-CIWVT-101133]

Responsible: Prof. Dr.-Ing. Gregor Wehinger
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Process Engineering (Unit Operations)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-CIWVT-101884	Chemical Process Engineering	6 CR	Wehinger

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

Competence Goal
Students can analyse and design reactors for chemical and enzymatic-biochemical conversions in homogeneous phase. They are able to promote the formation of a certain desired product in multi-step reactions, when parallel and consecutive steps can yield further products. Furthermore, students can apply balances of energy to identify conditions of safe reactor operation when exo- and endothermic reactions are run.

Content
Application of mass and energy balances for the analysis and design of ideal reactors for single-phase conversions, and for the identification of optimum operation conditions.

Module grade calculation
grade of the written examination

Workload

- Attendance time: lectures and exercises: 60 h
- self-study: 60 h
- preparation of examination. 60 h

Recommendation
Courses of 1st - 4th semester

Literature

- Skript Chemische Verfahrenstechnik I, https://ilias.studium.kit.edu
- G.W. Roberts: Chemical Reactions and Chemical Reactors, Wiley VCH 2009
- O. Levenspiel: Chemical Reaction Engineering, John Wiley & Sons Inc. 1998

M 4.13 Module: Circular Economy [M-CIWVT-105995]

Responsible: Prof. Dr.-Ing. Dieter Stapf
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	2

Mandatory			
T-CIWVT-112172	Circular Economy - Oral Exam	8 CR	Stapf
T-CIWVT-112173	Circular Economy - Project Work	4 CR	Stapf

Competence Certificate
The learning control consists of two partial achievements:

1. Oral exam on lectures, exercises and case studies, duration approx. 30 minutes.
2. Project work, exmaination of another type. The term paper and the presentation of the results are graded.

Prerequisites
Participation in the Specialization/ Project Work is only possible if the following achievements have been made:

- At least 60 credits
- At least one lab

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
The students understand important material systems and essential process steps of the provision and recycling of mineral and metallic raw materials and anthropogenic carbon. With the aim of closing cycles, they can use methods of process evaluation, such as analysis and assessment of process chains using efficiency indicators. To do this, students work on increasingly complex case studies in a team using scientific methods and finally apply these methods during project work.

Content
Introduction to transition in resources and technologies towards a sustainable circular economy. Knowledge acquisition in system analysis, in process efficiency assessment and in sustainability evaluation. Motivation for process engineering research and development in the field of sustainable raw material supply of a climate-neutral society:

- Material flow and process knowledge of the primary and the recycling industries
- Methodological knowledge (business management basics of relevance, material flow analysis, determination of performance indicators)
- Independent scientific work (application of knowledge, analysis, assessment) in case studies / as project work.

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Attendance time:

- Lectures and exercises: 45 h
- Project work: 80

Self-study:

- Wrap up lectures: 45 h
- Wrap up case studies: 60 h
- Preparation term paper and presentation: 40 h

Exam preparation: 90 h

M 4.14 Module: Control Engineering and System Dynamics [M-CIWVT-106308]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	3	1

Mandatory			
T-CIWVT-112787	Control Engineering and System Dynamics	5 CR	Meurer

Competence Certificate
Learning control is a written exam, duration120 minutes.

Prerequisites
None

Competence Goal
Provision of linear system theory and simple controls for technical systems to CIW and BIW engineers.

Content
Dynamic systems, Properties of important systems and modeling, Stability, Controller design, Estimation

Module grade calculation
The module grade is the grade of the written exam.

Workload
Attendance Time:

- Lectures:30 hrs.
- Exercises 15 hrs.

Self-study:

- Preparation and wrap-up lectures sample course: 60 hrs.
- Exam preparation: 45 hrs.

Literature

- Meurer: Regelungstechnik und Systemdynamik, Vorlesungsskript.
- Aström, R. Murray: Feedback Systems, Princeton University Press, 2008.
- C.T. Chen: Linear System Theory and Design, Oxford Univ. Press, 1999.
- Lunze: Regelungstechnik I, Springer-Verlag, 2010.
- Lunze: Regelungstechnik II, Springer-Verlag, 2010.
- H. Unbehauen: Regelungstechnik I, Vieweg, 2005.

M 4.15 Module: Data Analysis [M-CIWVT-106432]

Responsible: apl. Prof. Dr. Gisela Guthausen
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
3	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-113039	Data Analysis	3 CR	Guthausen

M 4.16 Module: Design of Machines [M-CIWVT-101941]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each summer term	1 term	German	3	1

Mandatory			
T-CIWVT-103641	Design of Machines	0 CR	Gleiß
T-CIWVT-103642	Design of Machines, Exam	7 CR	Gleiß

Competence Certificate
The learning contol consists of two partial achievements.

1. Completed coursework (ungraded)/ prerequisite. 4 of 5 exercises hase to be passed.
2. Written examination lasting 120 minutes.

Prerequisites
None

Content
Scientific drawing, introduction into material science with a focus on manufacturing an design of steel, design of machines and apparatuses, hygenic design

Module grade calculation
The module grade is the grade of the written exam.

Workload
Attendance time: lecture 2 SWH, exercises 3 SWH: 70 hrs
Self-study: 70 hrs
Preparation of exam: 70 hrs

Recommendation
Moduls of the 1st semester.

M 4.17 Module: Energy and Environmental Engineering (CIW-MVM-06) [M-CIWVT-101145]

Responsible: Prof. Dr. Reinhard Rauch
Prof. Dr.-Ing. Dimosthenis Trimis
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	4

Mandatory			
T-CIWVT-103527	Energy and Environmental Engineering Project Work	4 CR	Rauch, Trimis
T-CIWVT-108254	Energy and Environmental Engineering	8 CR	Rauch, Trimis

Competence Certificate
The learning control consists of two partial achievements:

- Written examination, duration 120 minutes
- Examination of another type, project work

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
The students will be able to discuss, analyze and compare applications in energy engineering and environmental protection (primary/secundary means, efficiency, raw materials etc.).

Content
Introduction into production of fuels (chemical energy carriers) from fossil and renewable sources and their use, prevention of formation of pollutants, removal of pollutants, review and selected examples, fundamentals and applications of high temperature energy conversion.

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Attendance time: 60 h
Excoursions: 20 h
Self-Study: 90 h
Project work: 90 h
Exam preparation: 100 h

Recommendation
Courses of 1st - 4 th semester

Literature
lecture notes and specific literature indicated during lectures, additionally:
J. Warnatz, U. Maas, R.W. Dibble: Combustion, Spinger Verlag, Berlin, Heidelberg 1997
G. Schaub, T. Turek: Energy Flows, Material Cycles and Global Development, Springer Verlag, Berlin 2011
M. Crocker (Hrsg.): Thermochemical Conversion of Biomass to Liquid Fuels and Chemicals, Springer-Verlag, Berlin 2010
E. Rebhan (Hrsg.): Energiehandbuch – Gewinnung, Wandlung und Nutzung von Energie, Springer-Verlag, Berlin 2002
B. Elvers (Hrsg.): Handbook of Fuels, Wiley-VCH, Weinheim 2008

M 4.18 Module: Energy Process Engineering (CIW-CEB-02) [M-CIWVT-101136]

Responsible: Prof. Dr.-Ing. Thomas Kolb
Prof. Dr. Oliver Thomas Stein
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Process Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-CIWVT-101889	Energy Process Engineering	5 CR	Kolb, Stein

Competence Certificate
Learning control is a written examination lasting 150 min.

Prerequisites
None.

Competence Goal
Students learn to classify energy and the different appearances of energy,knowledge of the different energy sources and the national and global energy demand,knowledge and solution of simple tasks in energy conversion with different conversion methods

Content
Basics: Concepts, forms of appearance of energy, systems and balances

Process Engineering: Energy carriers, energy conversion, energy transportation and storage, decentral energy systems

Ecology / Economy / Policy

Module grade calculation
Grade of the written examination

Workload
lectures: 56 h

self-study: 50 h

preparation of examination: 44 h

Recommendation
Thermodynamik

Literature

- In der Vorlesung angegebene Litaratur, zusätzlich:
- P. Stephan, K. Schaber, K. Stephan, F. Mayinger: Thermodynamik, Springer Verlag, Berlin 2006
- J. Warnatz, U. Maas, R.W. Dibble: Combustion, Spinger Verlag, Berlin, Heidelberg 1997
- G. Schaub, T. Turek: Energy Flows, Material Cycles and Global Development, Springer Verlag, Berlin 2011
- VDI-Gesellschaft Energietechnik (Hrsg.): Energietechnische Arbeitsmappe, Springer-Verlag , Berlin 2000
- M. Crocker (Hrsg.): Thermochemical Conversion of Biomass to Liquid Fuels and Chemicals, Springer-Verlag, Berlin 2010
- E. Rebhan (Hrsg.): Energiehandbuch – Gewinnung, Wandlung und Nutzung von Energie, Springer-Verlag, Berlin 2002
- B. Elvers (Hrsg.): Handbook of Fuels, Wiley-VCH, Weinheim 2008

M 4.19 Module: Engineering Mechanics: Dynamics (CIW-MVMA-03) [M-CIWVT-101128]

Responsible: TT-Prof. Dr. Christoph Klahn
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	3	2

Mandatory			
T-CIWVT-101877	Engineering Mechanics: Dynamics, Exam	5 CR	Klahn
T-CIWVT-106290	Engineering Mechanics: Dynamics	0 CR	Klahn

Competence Certificate
The learning control consists of two partial achievements

1. Completed coursework/ prerequisite
2. a written examination lasting 120 minutes

Prerequisites
None

Competence Goal
Students possess basic knowledge in Engineering Mechanics/Dynamics, they are familiar with problem solving and able to use this knowledge for theoretical analysis and solution of practical engineering problems.

Content
Kinematics and dynamics of mass point;
Kinematics and dynamics of rigid body;
The principle of linear momentum, angular momentum, work and energy theorem;
Oscillation of the systems with one or more freedom degrees;
Relative movement of mass point;
Methods in analytical Mechanics, Lagrange equation;

Module grade calculation
grade of the written examination. Superior preliminary test can be credited according to §7,13 SPO.

Workload
lectures and exercises: 56 h
self study: 56 h
preparation for examination 40h

Recommendation
modules of 1. -2. semester.

Literature

- Gross/Ehlers/Wriggers/Schröder/Mülle: Formeln und Aufgaben zur Technischen Mechanik 3, 13. Auflage https://doi.org/10.1007/978-3-662-66190-1
- Kühlhorn/Silber: Technische Mechanik für Ingenieure, Hüthig 2000
- Hibbler: Dynamik,Pearson 2006, 10. Auflage
- Wriggers/Nackenhorst/Beuermann/Spiess/Löhnert: Technische Mechanik kompakt, Teubner2006

M 4.20 Module: Engineering Mechanics: Statics [M-CIWVT-105846]

Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-111054	Engineering Mechanics: Statics	5 CR	Hochstein, Willenbacher

M 4.21 Module: Fluiddynamics (CIW-MVMV-03) [M-CIWVT-101131]

Responsible: Prof. Dr.-Ing. Hermann Nirschl
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-CIWVT-101882	Fluiddynamics, Exam	5 CR	Nirschl
T-CIWVT-101904	Fluiddynamics, Tutorial	0 CR	Nirschl

Competence Certificate
Learning control consists of:

1. written exam of 120 minutes duration according to § 4 (2) SPO.

2. Non-graded precondition for participation according to § 4 (3) SPO:
eihter 4 of 5 compulsory exercises have to be approved
or a group presentation has to be given during the lecture

Prerequisites
none

Competence Goal
The students have the ability to analyse, to structure and to describe problems in fluid dynamics. The also can use the specific methods for the calculation of specific flows with the studied tools. Besides they are able to discuss the different procedures critically.

Content
Fundamentals of fluid dynamics: hydro static, aerostatik, compressible and incompressible flows, turbulent flows, Navier-Stokes equations, boundary layer theory

Module grade calculation
grade of the written examination

Workload
lecture 2 SWH, exercises 2 SWH: 56 h
self-study: 56 h
preparation of examination: 56 h

Recommendation
Courses of 1st - 3rd semester

Literature
Nirschl, Zarzalis: Skriptum Fluidmechanik

Zierep: Grundzüge der Strömungslehre, Teubner 2008

Prandtl: Führer durch die Strömungslehre, Teubner 2008

M 4.22 Module: Food Bioprocess Engineering (BIW-LVT-02) [M-CIWVT-106476]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Process Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-CIWVT-113021	Food Bioprocess Engineering	6 CR	Karbstein
T-CIWVT-113041	Food Bioprocess Engineering - Prerequisite	0 CR	Karbstein

Competence Certificate
The Module comprises two learning controls:

1. Prerequisite: ungrades ILIAS-Test
2. written examination, duration 120 minutes

Prerequisites
In order to participate in the written exam, the prerequisite (Ilias tests) must be passed.

Competence Goal
The students will know about basics to secure food (and life science product) safety.

Content
The students will learn about microorganisms being important for food safety and biotechnological food production. Based on some historical products student will learn modern process technology. Technologies to secure food (and life science product safety) will be teached. Using actual case studies students will learn how food process engineers work. Process and product design will be rehearsed and practised in exercises and commented students' presentations.

Module grade calculation
The module grade is the grade of the written exam.

Workload
Attendance time/ lectures and exercises:

- 50 hrs self-study using the materials provided in ILIAS.
- 40 hrs lectures and exercises: discussion of the independently prepared learning content

Selbststudium:

- 50 hrs wrap-up of lectures and exercises
- 40 hrs exam preparation

Recommendation
Independent preparation of the classroom sessions using material in the ILIAS course (videos, worksheets, sample assignments) is essential for participation.

Literature

- Lebensmittelmikrobiologie (J. Krämer, UTB Ulmer)
- Lebensmittelbiotechnologie (Heinz Rutloff, Akademie Verlag)
- Lebensmittelverfahrenstechnik, Teil A (Schuchmann, Wiley)
- Lebensmittelbiotechnologie: eine Einführung (P. Czermak, GIT)
- Lebensmittelbiotechnolige (R. Heiss, Springer)
- Lexikon der Lebensmitteltechnologie (B. Kunz, Springer)
- Taschenatlas der Biotechnologie und Gentechnik (Rolf D. Schmid, Wiley)
- Mikroorganismen in Lebensmitteln (H. Keweloh, Pfanneberg)
- Mikrobiologie der Lebensmittel (G. Müller, H. Weber, Behr's)
- Grundzüge der Lebensmitteltechnik (H.-D. Tscheuschner, Behr's)
- Vorlesungsfolien, Skripte mit Übungsfragen, Vorlesungsvideos (ILIAS), FAQ zum Vorlesungsstoff und bereit gestellten Materialien (MS Teams)

M 4.23 Module: Food Bioprocess Engineering (BIW-LVT-02) [M-CIWVT-106436]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Bioprocess Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
9	Grade to a tenth	Each winter term	1 term	German	4	1

Mandatory			
T-CIWVT-113021	Food Bioprocess Engineering	6 CR	Karbstein
T-CIWVT-113022	Food Bioprocess Engineering Lab	3 CR	Karbstein
T-CIWVT-113041	Food Bioprocess Engineering - Prerequisite	0 CR	Karbstein

Competence Certificate
The Module comprises two learning controls:

1. written examination, duration 120 minutes

2. Lab

Prerequisites
In order to participate in the written exam and the lab course, the prerequisite (Ilias tests) must be passed.

Competence Goal
The students will know about basics to secure food (and life science product) safety.

Content
The students will learn about microorganisms being important for food safety and biotechnological food production. Based on some historical products student will learn modern process technology. Technologies to secure food (and life science product safety) will be teached. Using actual case studies students will learn how food process engineers work. Process and product design will be rehearsed and practised in exercises and commented students' presentations.

Module grade calculation
The module grade is the CP-weighted average of the two graded partial achievements.

Workload
Attendance time/ lectures and exercises:

- 50 hrs self-study using the materials provided in ILIAS.
- 40 hrs lectures and exercises: discussion of the independently prepared learning content

Selbststudium:

- 50 hrs wrap-up of lectures and exercises
- 40 hrs exam preparation

Lab-Course: One week

- 40 hrs attendance time
- 50 hrs preparation of laboratory experiments, preparation of the experimental protocols

Recommendation
Independent preparation of the classroom sessions using material in the ILIAS course (videos, worksheets, sample assignments) is essential for participation.

Literature

- Lebensmittelmikrobiologie (J. Krämer, UTB Ulmer)
- Lebensmittelbiotechnologie (Heinz Rutloff, Akademie Verlag)
- Lebensmittelverfahrenstechnik, Teil A (Schuchmann, Wiley)
- Lebensmittelbiotechnologie: eine Einführung (P. Czermak, GIT)
- Lebensmittelbiotechnolige (R. Heiss, Springer)
- Lexikon der Lebensmitteltechnologie (B. Kunz, Springer)
- Taschenatlas der Biotechnologie und Gentechnik (Rolf D. Schmid, Wiley)
- Mikroorganismen in Lebensmitteln (H. Keweloh, Pfanneberg)
- Mikrobiologie der Lebensmittel (G. Müller, H. Weber, Behr's)
- Grundzüge der Lebensmitteltechnik (H.-D. Tscheuschner, Behr's)
- Vorlesungsfolien, Skripte mit Übungsfragen, Vorlesungsvideos (ILIAS), FAQ zum Vorlesungsstoff und bereit gestellten Materialien (MS Teams)

M 4.24 Module: Food Technology (CIW-LVT-03) [M-CIWVT-101148]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Duration	Language	Level	Version
12	Grade to a tenth	2 terms	German	4	4

Mandatory			
T-CIWVT-103528	Food Technology	5 CR	Karbstein
T-CIWVT-103529	Food Technology Project Work	7 CR	Karbstein

Competence Certificate
The learning control consists of two partial achievements:

1. Written examination, duration 60 minutes
2. Project work (presentation and report of results)

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
The students are able to design and evaluate simple food products. They learned to define, focus and solve tasks milestone-oriented as an interdisciplinary team. The gained in depth insight in the influence of recipe and process parameters on food quality parameters using a selected product produced on pilot scale. They will be able to present targets and results of their team project in a clear, conceptual and comprehensible manner.

Content
Lecture: Basic introduction to the design and quality assurance of selected foods;
project work (team work): definition, production and evaluation of selected products as a team; presentation and defense of the project and its results incl. degustation in a bigger group;
field trip to industrial production plants

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload

- Attendance time: 115 hrs
  (lecture 1 SWS, exercises 1 SWS, project work 5 SWS)
- self study: 185 hrs
  (project design, project meetings, research on project work, lab, preparation and wrap-up)
- exam preparation: 60 hrs

Literature
Will be offered within the lecture, depending on products available

M 4.25 Module: Fundamentals of Heat and Mass Transfer (CIW-TVT-01) [M-CIWVT-101132]

Responsible: Prof. Dr.-Ing. Wilhelm Schabel
Prof. Dr.-Ing. Thomas Wetzel
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each summer term	1 term	German	3	1

Mandatory			
T-CIWVT-101883	Fundamentals of Heat and Mass Transfer	7 CR	Schabel, Wetzel

Competence Certificate
Success control is a written examination, duration 180 minutes according to § 4 Abs. 2 SPO.

Prerequisites
none

Competence Goal
Elaborating the fundamental physics and laws of heat and mass transfer and at the provision of knowledge about of the methodological tools required for solving engneering tasks in these fields.

Content
Heat Transfer: Definitions - System, balances and conservation equations, kinetics of heat transfer, heat conduction, heat radiation, heat transfer between solids and moving fluids, dimensionless numbers.

Mass Transfer: Kinetics of mass transfer, equilibrium, diffusion and mass flow, Knudsen- and multi-component diffusion, Lewis analogy of heat and mass transfer.

Module grade calculation
Grade of the written examination

Workload
lecture: 75 h

self-study: 55 h

preparation of examination: 80 h

Recommendation
Courses of 1st - 3rd semester, especially fundamentals of themodynamics.

Literature
v. Boeckh, Wetzel: Wärmeübertragung, Springer 2009

Schabel: Stoffübertragung I, Skript

M 4.26 Module: Fundamentals of Refrigeration (CIW-TTK-03) [M-CIWVT-104457]

Responsible: Prof. Dr.-Ing. Steffen Grohmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	3	4

Mandatory			
T-CIWVT-109117	Fundamentals of Refrigeration, Oral Examination	6 CR	Grohmann
T-CIWVT-109118	Fundamentals of Refrigeration, Project Work	6 CR	Grohmann

Competence Certificate
The learning control consists of two partial achievements:

1. Project work/ presentation, examination of another type
2. Oral exam of about 30 minutes duration

The project work is a prerequisite for the oral examination.

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
Students are able to explain and apply the fundamentals of refrigeration to various refrigeration technologies. They are able to describe properties of refrigerants and working fluids, and to assess their environmental impact based in different criteria. The students can develop concepts of refrigeration and heat pump processes using phase diagrams and fluid property models, and they are able to explore the energy consumption based on first and second law analyses. They are able to design various circuit configurations, to dimension and select refrigeration compressors and heat exchangers, and to design suitable control systems.

Content
Introduction to the fundamentals of refrigeration, phase diagrams, energy transformation based on first and second law analyses, refrigerants and working fluids including their environmental impact, design of common refrigeration and heat pump processes, major circuit components and process control.

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Attendance time: Lecture 2 SWS, Exercises 1 SWS: 45 h
Self-Study: 60 h
Exam Praparation: 75 h
Project work including presentation: 180 h

Recommendation
None

Literature

- Jungnickel, H., Agsten, R. und Kraus, W.E., 3. Auflage (1990), Verlag Technik GmbH, Berlin
- v. Cube, H.L. (Hrsg.), Lehrbuch der Kältetechnik Band 1 und 2, 4. Auflage (1997), C.F. Müller, Heidelberg
- Gosney, W.B., Principles of Refrigeration, Cambridge University Press, Cambridge, 1982
- Berliner, P., Kältetechnik Vogel-Verlag, Würzburg (1986 und frühere)
- Kältemaschinenregeln, Deutscher Kälte- und Klimatechnischer Verein (DKV) (Herausgeber)
- DKV-Arbeitsblätter für die Wärme- und Kältetechnik in: C.F. Müller Verlag, Hüthig Gruppe, Heidelberg, wird jeweils aktualisiert (Sept. 2008)

M 4.27 Module: Further Examinations [M-CIWVT-102017]

Organisation: KIT Department of Chemical and Process Engineering
Part of: Additional Examinations

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	1 term	German	3	1

Prerequisites
None

M 4.28 Module: General Chemistry and Chemistry of Aqueous Solutions [M-CIWVT-106431]

Responsible: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-101892	General Chemistry and Chemistry of Aqueous Solutions	6 CR	Horn

Competence Certificate
Learning control is a written exam, 150 min to lecture " General Chemistry and Chemistry of Aqueous Solutions" (lecture 3 SWS, exercises 2 SWS)

Prerequisites
None

Competence Goal
The students receive a basic knowledge of the general chemistry. They get basic knowledge about the periodic system of the elements, the chemical bonds, and the geometry of molecules. They can describe the principles and the criteria about the reactions in aqueous solutions, about acid and bases, reaction kinetics, the chemical equilibrium and electrochemistry.

Content
Basics of general, inorganic and physical chemistry.

Module grade calculation
The module grade ist the grade of the wirtten exam.

Workload

- Attendance time lecture: 60 h
- Preparation/follow-up: 60 h
- Examination + exam. preparation: 60 h

Literature

- Mortimer, Müller: Chemie, current edition, Thieme Verlag 2014
- Riedel, Meyer: Allgemeine und Anorganische Chemie, current edition, de Gruyter Verlag 2013
- Horn: Scriptum of the lectures, current edition, will be available in ILIAS

M 4.29 Module: Industrial Organic Chemistry (CIW-MAB-03) [M-CIWVT-101137]

Responsible: Prof. Dr. Reinhard Rauch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Process Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-101890	Industrial Organic Chemistry	5 CR	Rauch

Competence Certificate
Learning control is a written examination of 120 min duration according to § 4 Abs. 2 SPO.

Prerequisites
Organic Chemistry

Competence Goal
Consolidate knowledge of organic materials and types of chemical reactions; understand logic relations between types of chemical reaction and technical processes, for selected examples; understand industrial material conversion pathways from raw materials to final products.

Content
Feedstock's for industrial processes of organic chemistry, industrial production of basic chemicals and intermediates using practical examples, digitalization and industry 4.0 in the chemical industry.

Mechanism during formation of synthetic macromolecules, production and properties of plastics and polymers, spectroscopic methods of analyzing organic molecules.

Module grade calculation
grade of the written examination

Workload
lecture: 60 h
self-study: 40 h
preparation of examination: 50 h

Literature
Handouts
Onken, Behr: Chem. Prozeßkunde, Wiley-VCH 1996
Arpe: Industrielle Org. Chemie, Wiley-VCH 2007
Brahm: Polymerchemie kompakt, Hirzel 2009
Tieke: Makromolekulare Chemie, Wiley-VCH 2014
Hesse u.a.: Spektroskop. Methoden in der OC, Thieme 2011

M 4.30 Module: Intensification of Bioprocesses [M-CIWVT-106444]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Process Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-CIWVT-112998	Intensification of Bioprocesses - Written Exam	6 CR	Holtmann

Competence Certificate
The learing controlis a written examination, duration: 90 minutes.

Prerequisites
None

Competence Goal
Technical and methodological competencies

Students will be able to:

- explain the concepts of process intensification
- describe different intensified processes quantitatively
- design and evaluate bioprocess engineering processes on the basis of PI
- analyse interdisciplinary problems at the interface of technology and biological systems and develop solutions to problems
- develop processes with optimal productivities using as little energy and raw materials as possible by combining the advantages of individual disciplines

Social and personal competence

The students will be able to:

- analyse the framework conditions for innovative processes and identify the essential aspects
- identify and evaluate (interdisciplinary) process options
- become independently familiar with new topics
- summarize complex scientific processes

Content
Companies in the chemical and biotechnology industries face particular challenges in times of rising raw material costs, increased competition, and shorter product life cycles.

Process-intensified operations offer great potential for resource efficiency by helping to save materials and energy. According to a generally accepted definition, "Process Intensification (PI) is a collection of revolutionary innovative principles (paradigm shifts) for equipment and processes that can lead to significant improvements in process or process chain efficiency, investment and operating costs, quality, waste, process safety (and other aspects)".

In recent years, process intensification methods have been increasingly used in bioprocess engineering (USP and DSP). These methods are the focus of this module. The following topics are covered in the module:

- Definition of PI, distinction between process optimization and PI.
- Examples from chemical engineering
- Intensified bioreactors and reactor selection (e.g., single-use technologies, rotating bed reactors, enzyme membrane reactors, biofilm reactors)
- PI through adapted operating modes (e.g., repeated fed-batch, perfusion, continuous processes, in situ product removal)
- Process intensification through immobilized enzymes and microorganisms
- Integration of chemo- and biocatalysis
- Electro biotechnological processes
- Photo biotechnological processes
- Use of ultrasound and microwaves for bioprocess intensification
- Bioprocesses in alternative reaction media
- Use of extremophilic organisms / unconventional production organisms

In all sub-areas, the focus is on the quantitative description of the intensified processes.

Module grade calculation
The module grade is the grade of the written exam.

Workload

- Attendance time: 60 hrs lectures and exercieses
- Preparation and wrap-up lectures: 80 hrs
- Exam preparation: 40 hrs

Recommendation
Fundamentals in bioprocess engineering are required.

Literature

- Frerich J. Keil (2017) Process intensification, doi.org/10.1515/revce-2017-0085
- Andrzej Stankiewicz, Tom van Gerven, Georgios Stefanidis (2019) The Fundamentals of Process Intensification, Wiley-VCH, Weinheim, ISBN: 978-3-527-32783-6
- VDI ZRE Publikationen: Kurzanalyse Nr. 24, Ressourceneffizienz durch Prozessintensivierung
- Burek et al (2022) Process Intensification as Game Changer in Enzyme Catalysis, https://doi.org/10.3389/fctls.2022.858706

Further literature recommendations will be announced.

M 4.31 Module: Intensification of Bioprocesses [M-CIWVT-106416]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Process Engineering (Specialization Bioprocess Engineering)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
9	Grade to a tenth	Each summer term	1 term	German	4	1

Mandatory			
T-CIWVT-112998	Intensification of Bioprocesses - Written Exam	6 CR	Holtmann
T-CIWVT-112999	Intensivication of Bioprocesses - Lab	3 CR	Holtmann, Neumann

Competence Certificate
The learing control consists of two partial achievements:

- Written examination, duration: 90 minutes
- Laboratory work: Examination of anaother type

Prerequisites
None

Competence Goal
Technical and methodological competencies

Students will be able to:

- explain the concepts of process intensification
- describe different intensified processes quantitatively
- design and evaluate bioprocess engineering processes on the basis of PI
- analyse interdisciplinary problems at the interface of technology and biological systems and develop solutions to problems
- develop processes with optimal productivities using as little energy and raw materials as possible by combining the advantages of individual disciplines

Social and personal competence

The students will be able to:

- analyse the framework conditions for innovative processes and identify the essential aspects
- identify and evaluate (interdisciplinary) process options
- become independently familiar with new topics
- summarize complex scientific processes

Content
Companies in the chemical and biotechnology industries face particular challenges in times of rising raw material costs, increased competition, and shorter product life cycles.

Process-intensified operations offer great potential for resource efficiency by helping to save materials and energy. According to a generally accepted definition, "Process Intensification (PI) is a collection of revolutionary innovative principles (paradigm shifts) for equipment and processes that can lead to significant improvements in process or process chain efficiency, investment and operating costs, quality, waste, process safety (and other aspects)".

In recent years, process intensification methods have been increasingly used in bioprocess engineering (USP and DSP). These methods are the focus of this module. The following topics are covered in the module:

- Definition of PI, distinction between process optimization and PI.
- Examples from chemical engineering
- Intensified bioreactors and reactor selection (e.g., single-use technologies, rotating bed reactors, enzyme membrane reactors, biofilm reactors)
- PI through adapted operating modes (e.g., repeated fed-batch, perfusion, continuous processes, in situ product removal)
- Process intensification through immobilized enzymes and microorganisms
- Integration of chemo- and biocatalysis
- Electro biotechnological processes
- Photo biotechnological processes
- Use of ultrasound and microwaves for bioprocess intensification
- Bioprocesses in alternative reaction media
- Use of extremophilic organisms / unconventional production organisms

In all sub-areas, the focus is on the quantitative description of the intensified processes.

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Lectures and exercises:

- Attendance time: 60 hrs
- Preparation and wrap-up lectures: 80 hrs
- Exam preparation: 40 hrs

Lab course (90 hrs in total)

- Preparation
- Experiments
- Experimental protocols

Recommendation
Fundamentals in bioprocess engineering are required.

Literature

- Frerich J. Keil (2017) Process intensification, doi.org/10.1515/revce-2017-0085
- Andrzej Stankiewicz, Tom van Gerven, Georgios Stefanidis (2019) The Fundamentals of Process Intensification, Wiley-VCH, Weinheim, ISBN: 978-3-527-32783-6
- VDI ZRE Publikationen: Kurzanalyse Nr. 24, Ressourceneffizienz durch Prozessintensivierung
- Burek et al (2022) Process Intensification as Game Changer in Enzyme Catalysis, https://doi.org/10.3389/fctls.2022.858706

Further literature recommendations will be announced.

M 4.32 Module: Introduction into Bioengineering [M-CIWVT-106433]

Responsible: Prof. Dr.-Ing. Alexander Grünberger
Prof. Dr.-Ing. Dirk Holtmann
Prof. Dr.-Ing. Jürgen Hubbuch
Prof. Dr.-Ing. Heike Karbstein

Organisation: KIT Department of Chemical and Process Engineering

Part of: Fundamentals of Process Engineering (mandatory)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each winter term	1 term	German	3	1

Mandatory			
T-CIWVT-113018	Introduction into Bioengineering	5 CR	Grünberger, Holtmann, Hubbuch, Karbstein

M 4.33 Module: Mathematical Modeling for Biochemical Engineering [M-MATH-106443]

Responsible: PD Dr. Gudrun Thäter
Organisation: KIT Department of Mathematics
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
4	Grade to a tenth	Each summer term	1 term	German	3	1

Mandatory			
T-MATH-113040	Mathematical Modeling for Biochemical Engineering	4 CR	Thäter

M 4.34 Module: Mechanical Processing (CIW-MVMG-01) [M-CIWVT-101135]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Process Engineering (Unit Operations)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-CIWVT-101886	Mechanical Processing	6 CR	Dittler

Competence Certificate
The learning control is a written examination lasting 120 minutes.

Prerequisites
None

Competence Goal
Students have a basic understanding of properties & behavior of particulate systems in important engineering applications; they are able to use this understanding for calculations and design of selected processes.

Content

- Unit operations of mechanical processing - introduction and overview
- Particle size distribution - determination, depiction, conversion
- Forces on particles in flows
- Separating function - characterization of a separations process
- Fundamentals of mixing and stirring
- Introduction to dimensional analysis
- Characterizations of packings
- Capillarity in porous systems
- Flow through porous systems, fluidized bed
- Fundamentals of agglomeration
- Fundamentals of storage and conveyance

Module grade calculation
The module grade is the grade of the written exam.

Workload

- Attendance time: Lectures and exercises: 60 hrs
- Self-study: 45 hrs (about three hours per week)
- Preparation of examination: 75 hrs

Recommendation
Courses of 1st - 4th semester

Literature

- Dittler, Skriptum MVT
- Löffler, Raasch: Grundlagen der Mechanischen Verfahrenstechnik, Vieweg 1992
- Schubert, Heidenreich, Liepe, Neeße: Mechanische Verfahrenstechnik, Deutscher Verlag Grundstoffindustrie, Leipzig 1990
- Dialer, Onken, Leschonski: Grundzüge Verfahrenstechnik&Reaktionstechnik, Hanser Verlag 1986
- Zogg: Einführung in die Mechanische Verfahrenstechnik, Teubner 1993

M 4.35 Module: Mechanical Separation Technology (CIW-MVMV-06) [M-CIWVT-101147]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	3

Mandatory			
T-CIWVT-103448	Mechanical Separation Technology Exam	8 CR	Gleiß
T-CIWVT-103452	Mechanical Separation Technology Project Work	4 CR	Gleiß

Competence Certificate
The learning control consists of two partial achievements:

1. An oral individual examination with a duration of about 30 minutes for the lecture "Mechanical Separation Technology" and related exercises

2. Project work. Practical collaboration, written report and oral presentation of the results are rated.

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
The students are able to explain the fundamental laws and the derived physical principles of the particle separation from liquids and not only to relate them to the principally suited separation apparatuses but also special variants. They have the ability to apply the relationship betwen product operation and design parameters to different separation techniques. They can analyse separation problems with scientific methods and give alternative problem solution proposals. The students are able to execute their fundamental and process knowledge practically to the example of beer brewing.

Content
Physical fundamentals, apparatuses, applications,strategies; characterisation of particle systems and slurries; pretreatment methods to enhance the separability of slurries; fundamentals, apparatuses and process technology of static and centrifugal sedimentation, flotation, depth filtration, crossflow filtration, cake forming vacuum and gas overpressure filtration, filter centrifuges and press filters; filter media; selection criteria and scale-up methods for separation apppartuses and machines; apparatus combinations; case studies to solve sparation problems.

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload
Lecture 3 SWS exercises 1 SWS:

- attendance time: 60h
- self-study: 80h
- examination preparation: 80h

project work

- attendance time and self-study: 140h

Literature
Anlauf: Script "Mechanische Separationstechnik - Fest/Flüssig-Trennung"

M 4.36 Module: Micro Process Engineering (CIW-IMVT-01) [M-CIWVT-101154]

Responsible: Prof. Dr.-Ing. Peter Pfeifer
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	3

Mandatory			
T-CIWVT-103666	Micro Process Engineering	7 CR	Pfeifer
T-CIWVT-103667	Micro Process Engineering	5 CR	Pfeifer

Competence Certificate
The learning control consists of three partial achievements:

1. Oral examination of about 25 minutes duration
2. project work

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
The students are able apply the methods of process intensification by microstructuring of the reaction zone and are capable of analyzing the advantages and disadvantages while transferring given processes into microreactors. With knowledge of special production processes for micro reactors, students are able to design microstructured systems in terms of heat exchange and to analyze the possibilities of transferring processes from conventional technology into the microreactor with regard to heat transfer performance. They understand also how the mechanisms of mass transport and mixing interact in microstructured flow mixers, and are able to apply this knowledge to the combination of mixing and reaction. They can also analyze possible limitations in the process adaptation and are thus able to design microstructured reactors for homogeneous reactions appropriately. The students understand the significance of the residence time distribution for the conversion and selectivity and are capable of analyzing the interaction of mass transport by diffusion and hydrodynamic residence time in microstructured equipment in given applications.

Content
Basic knowledge of micro process engineering systems: fabrication of microstructured systems and interaction with processes, intensification of heat exchange and special effects by heat conduction, residence time distribution in reactors and peculiarities in microstructured systems, structured flow mixers (designs and characterization) and dimensioning of structured reactors with regard to heat and mass transfer.

Module grade calculation
The module grade is the CP-weighted average of the two partial achievements.

Workload

- Attendance time: Lectures and exercises 60 hrs
- Self-study: 60 hrs
- Exam preparation: 2 weeks/ 60 hrs
- Project work: 180 hrs

Literature
Scriptum (slides collection)

text books:

- Kockmann, Norbert (Hrsg.), Micro Process Engineering, Fundamentals, Devices, Fabrication, and Applications, ISBN-10: 3-527-31246-3
- Micro Process Engineering - A Comprehens (Hardcover), Volker Hessel (Editor), Jaap C. Schouten (Editor), Albert Renken (Editor), Yong Wang (Editor), Junichi Yoshida (Editor), 3 Bände, 1500 Seiten, Wiley VCH, ISBN-10: 3527315500
- Winnacker-Küchler: Chemische Technik, Prozesse und Produkte, BAND 2: NEUE TECHNOLOGIEN, Kapitel Mikroverfahrenstechnik S. 759-819, ISBN-10: 3-527-30430-4
- Emig, Gerhard, Klemm, Elias, Technische Chemie, Einführung in die chemische Reaktionstechnik, Springer-Lehrbuch, 5., aktual. u. erg. Aufl., 2005, 568 Seiten, ISBN-10: 3-540-23452-7 (Kapitel Mikroreaktionstechnik S. 444-467)
- Chemical Kinetics, ISBN 978-953-51-0132-1 "Application of Catalysts to Metal Microreactor Systems", P. Pfeifer, http://www.intechopen.com/books/chemical-kinetics/application-of-catalysts-to-metal-microreactor-systems

M 4.37 Module: Module Bachelor's Thesis [M-CIWVT-106580]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: Bachelor's Thesis

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each term	1 term	German	3	1

Mandatory			
T-CIWVT-113255	Bachelor's Thesis	12 CR	

Prerequisites
None

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 120 credits in your course of studies.

M 4.38 Module: Organic Chemistry for Engineers (CIW-CHEM-04) [M-CHEMBIO-101115]

Responsible: Prof. Dr. Michael Meier
Organisation: KIT Department of Chemistry and Biosciences
Part of: Fundamentals of Mathematics and Natural Sciences

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
5	Grade to a tenth	Each summer term	1 term	German	3	1

Mandatory			
T-CHEMBIO-101865	Organic Chemistry for Engineers	5 CR	Meier

Competence Certificate
graded: written examination

Prerequisites
none

Competence Goal
Relevance of Organic Chemistry; fundamental and method-oriented knowledge;correlation between structure and reactivity;knowledge of important concepts and principles;self-solving of problems in Organic Chemistry

Content
Nomenclature, electronic structure and bonding of organic molecules; Organic substance classes and functional groups; Reaction mechanisms and synthesis of organic compounds; Stereoisomers and optical activity; Synthetic polymers and biopolymers;Identification of organic compounds

Module grade calculation
grade of the written examination

Workload
lectures and exercises: 34h

homework and preparation of examination: 86h

Literature
Paula Y. Bruice: Organic Chemistry, 5th ed., Prentice Hall, 2007

Paula Y. Bruice: Study guide and solutions manual, 5th ed., Prentice Hall, 2007

K.P.C. Vollhardt, Neil Schore: Organic Chemistry, 5th ed., Palgrave Macmillan, 2006

K.P.C. Vollhardt, Study guide and solutions manual, 5th ed., Palgrave Macmillan, 2006

M 4.39 Module: Orientation Exam [M-CIWVT-106447]

Organisation: KIT Department of Chemical and Process Engineering
Part of: Orientation Exam

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
0	pass/fail	Each term	2 terms	German	3	1

Mandatory			
T-MATH-100275	Advanced Mathematics I	7 CR	Arens, Griesmaier, Hettlich
T-MATH-100525	Tutorial Advanced Mathematics I	0 CR	Arens, Griesmaier, Hettlich
T-CIWVT-111062	Cell Biology	3 CR	Gottwald
T-CIWVT-111063	Genetics	2 CR	Neumann

Modelled deadline
This module must be passed until the end of the **3. term**.

Prerequisites
None

Annotation
For students who are or were enrolled in a degree program in the summer semester 2020, winter semester 2020/2021, summer semester 2021, or winter semester 2021/2022, the deadline for taking the orientation exam has been extended by one semester in each case (section 32 (5 a), sentence 1 LHG).
This means that the deadline has been extended for

- *students enrolled in one of the above semesters in the same program by one semester;*
- *students enrolled in two of the above semesters in the same program by two semesters;*
- *students enrolled in three or more of the above semesters in the same program by a maximum of three semesters.*

M 4.40 Module: Process Development and Scale-up (CIW-IKFT-01) [M-CIWVT-101153]

Responsible: Prof. Dr.-Ing. Jörg Sauer
Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
12	Grade to a tenth	Each winter term	2 terms	German	4	4

Mandatory			
T-CIWVT-103530	Process Development and Scale-up	8 CR	Sauer
T-CIWVT-103556	Process Development and Scale-up Project Work	4 CR	Sauer
T-CIWVT-111005	Exercises Process Development and Scale-up	0 CR	Sauer

Competence Certificate
The learning control consists of three partial achievements:

- Project work/ presentation and report
- Ungraded online-tests (prerequisite for oral examination)
- Individual oral examination, duration 30 minutes

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to have earned at least 60 credits in your course of studies.

Competence Goal
The students are capable of developing energy and material balances for complex processes in process technology and to analyze processes in terms of potentials for optimization. They are able to derive suitable methods for the optimization of such processes.
The students are able to calculate the costs of major pieces of equipment and to apply estimation methods for investment costs of production plants. Together with the calculation of variable production costs they are able to analyze the profitability of a chemical process plant. Furthermore the students learn basic concepts of project management, they are enabled to work in teams and guided for intependent scientific work.

Content
Introduction into the basics of process development and project management for the development of chemical processes from the lab into production scale, including the design of a chemical process, design of miniplants and scale-up into production scale. Overview over methods for the economic, technical evaluation of processes and the preparation of business concepts.

Module grade calculation
50 % oral examination, 50 % project work.

Annotation
As part of the project study a visit to the IKFT and the bioliq plant at the Campus North is intended.

Workload
Lecture and Exercise:
Attendance time: 45 h
Self-study: 90 h
Exam preparation: 45 h

Project work: 180 h

Literature

- Vorlesungs- und Übungsfolien (KIT Studierendenportal ILIAS)
- Helmus, F. P., Process Plant Design: Project Management from Inquiry to Acceptance, Wiley-VCH, 2008.
- Towler, G., Sinnott, R. K., Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design, Butterworth-Heinemann, 2012.
- Peters, M.S., Timmerhaus, K.D., West R.E.: Plant Design and Economics for Chemical Engineers, 2003, Mc Graw-Hill, NY.
- Seider, W.D., Seader, J.D., Lewin, D. R., Widagdo, S.: Product and Process Design Principles, Wiley & Sons, NY, 2010.
- Vogel, G.H.:. Verfahrensentwicklung, Wiley-VCH, 2002.
- Belbin, R.M., Management Teams, Why They Succeed or Fail, Routledge, NY, 2013.
- Busse von Colbe, W.; Coenenberg, A.G., Kajüter, P., Linnhoff, U., Betriebswirtschaftslehre für Führungskräfte, 2002, S. 148

M 4.41 Module: Programming and Numeric Simulation Using MATLAB [M-CIWVT-106438]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: Interdisciplinary Qualifications

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
3	pass/fail	Each summer term	1 term	German	3	1

Mandatory			
T-CIWVT-113025	Programming and Numeric Simulation Using MATLAB	1 CR	Meurer
T-CIWVT-113074	Programming and Numeric Simulation Using MATLAB - Ecercises	2 CR	Meurer

Prerequisites
None

Module grade calculation
Ungraded

M 4.42 Module: Scientific Writing with LaTeX [M-HOC-106502]

Organisation:

Part of: Interdisciplinary Qualifications

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
2	pass/fail	Each winter term	1 term	German	3	1

Mandatory			
T-HOC-113121	Scientific Writing with LaTeX	2 CR	Hirsch-Weber

M 4.43 Module: Single Results [M-CIWVT-101991]

Responsible: Dr.-Ing. Barbara Freudig
Organisation: KIT Department of Chemical and Process Engineering
Part of: Master's Transfer Account

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
30	pass/fail	Each term	1 term	German	3	3

Master Transfer Examinations (Election: at least 30 credits)			
T-CIWVT-106028	Particle Technology Exam	6 CR	Dittler
T-CIWVT-106029	Biopharmaceutical Purification Processes	6 CR	Hubbuch
T-CIWVT-106030	Biotechnological Production	6 CR	Holtmann
T-CIWVT-106032	Kinetics and Catalysis	6 CR	Wehinger
T-CIWVT-106033	Thermodynamics III	6 CR	Enders
T-CIWVT-106034	Thermal Transport Processes	6 CR	Kind, Schabel, Wetzel
T-CIWVT-106035	Computational Fluid Dynamics	6 CR	Nirschl
T-CIWVT-106036	Internship	14 CR	Bajohr, Freudig
T-CIWVT-106037	Selected Formulation Technologies	6 CR	Karbstein, Leister
T-CIWVT-106148	Practical Course Process Technology and Plant Design	0 CR	Kolb
T-CIWVT-106149	Initial Exam Process Technology and Plant Design	0 CR	Kolb
T-CIWVT-106150	Process Technology and Plant Design Written Exam	8 CR	Kolb
T-CIWVT-108492	Seminar Biotechnological Production	0 CR	Holtmann
T-CHEMBIO-109178	Physical Chemistry (Written Exam)	4 CR	Kubar, Meier
T-CHEMBIO-109179	Physical Chemistry (Lab)	2 CR	Kubar, Meier
T-CIWVT-112766	Bioprocess Development	6 CR	Grünberger
T-CIWVT-113235	Excercises: Membrane Technologies	1 CR	Horn, Saravia
T-CIWVT-113236	Membrane Technologies in Water Treatment	5 CR	Horn, Saravia

Prerequisites
None

M 4.44 Module: Supplementary Studies on Culture and Society [M-ZAK-106235]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
22	Grade to a tenth	Each term	3 terms	German	3	1

Election notes
With the exception of the final oral exam and the practice module, students have to self-record the achievements obtained in the Supplementary Studies on Culture and Society in their study plan. ZAK records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the ZAK homepage at https://www.zak.kit.edu/begleitstudium-bak.php. The title of the examination and the amount of credits override the modules placeholders.

If you want to use ZAK achievements **both for your interdisciplinary qualifications and for the supplementary studies**, please record them in the interdisciplinary qualifications first. You can then get in contact with the ZAK study services (stg@zak.kit.edu) to also record them in your supplementary studies.

In the in-depth module, achievements have to be obtained in three different areas. The areas are as follows:

- Technology & Responsibility
- Doing Culture
- Media & Aesthetics
- Spheres of Life
- Global Cultures

You have to obtain two achievements with 3 credits each and one achievement with 5 credits. To self-record achievements in the in-depth module, you first have to elect the matching partial achievement.

Note: If you registered for the Supplementary Studies on Sustainable Development before April 1st, 2023, self-recording an achievement in this module counts as a request in the sense of §20 (2) of the regulations for the Supplementary Studies on Culture and Society. Your overall grade for the supplementary studies will thus be calculated as the average of the examantion grades, not as the average of the module grades.

Mandatory			
T-ZAK-112653	Basics Module - Self Assignment BAK	3 CR	Mielke, Myglas
In-depth Module (Election: 3 items)			
T-ZAK-112654	In-depth Module - Technology & Responsibility - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112655	In-depth Module - Doing Culture - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112656	In-depth Module - Media & Aesthetics - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112657	In-depth Module - Spheres of Life - Self Assignment BAK	3 CR	Mielke, Myglas
T-ZAK-112658	In-depth Module - Global Cultures - Self Assignment BAK	3 CR	Mielke, Myglas
Mandatory			
T-ZAK-112660	Practice Module	4 CR	Mielke, Myglas
T-ZAK-112659	Oral Exam - Supplementary Studies on Culture and Society	4 CR	Mielke, Myglas

Competence Certificate
The monitoring is explained in the respective partial achievement.

They are composed of:

- minutes
- presentations
- a seminar paper
- an internship report
- an oral examination

After successful completion of the supplementary studies, the graduates receive a graded certificate and a KIT certificate.

Prerequisites
The offer is study-accompanying and does not have to be completed within a defined period of time. Enrolment or acceptance for graduation must be present when registering for the final examination.

KIT students register for the supplementary studies by selecting this module in the student portal and self-checking a performance. In addition, registration for the individual courses is necessary, which is possible shortly before the beginning of each semester.

The course catalogue, statutes (study regulations), registration form for the oral exam, and guides for preparing the various written performance requirements can be found as downloads on the ZAK homepage at www.zak.kit.edu/begleitstudium-bak.

Competence Goal
Graduates of the Supplementary Studies on Culture and Society demonstrate a sound basic knowledge of conditions, procedures and concepts for analysing and shaping fundamental social development tasks in connection with cultural topics. They have gained a well-founded theoretical and practical insight into various cultural studies and interdisciplinary topics in the field of tension between culture, technology and society in the sense of an expanded concept of culture.

They are able to place the contents selected from the specialization module in the basic context as well as to analyse and evaluate the contents of the selected courses independently and exemplarily and to communicate about them scientifically in written and oral form. Graduates are able to analyse social topics and problem areas and critically reflect on them in a socially responsible and sustainable perspective.

Content
The Supplementary Studies on Culture and Society can be started from the 1st semester and is not limited in time. It comprises at least 3 semesters. The supplementary studies are divided into 3 modules (basics, in-depth studies, practice). A total of 22 credit points (ECTS) are earned.

The thematic elective areas of the supplementary studies are divided into the following 5 modules and their sub-topics:

Block 1Technology & Responsibility

Value change / ethics of responsibility, technology development / history of technology, general ecology, sustainability

Block 2Doing Culture

Cultural studies, cultural management, creative industries, cultural institutions, cultural policy

Block 3Media & Aesthetics

Media communication, cultural aesthetics

Block 4Spheres of Life

Cultural sociology, cultural heritage, architecture and urban planning, industrial science

Block 5Global Cultures

Multiculturalism / interculturalism / transculturalism, science and culture

Module grade calculation
The overall grade of the supplementary studies is calculated as an average of the grades of the examination performances weighted with credit points.

In-depth Module

- presentation 1 (3 ECTS)
- presentation 2 (3 ECTS)
- seminar paper incl. presentation (5 ECTS)
- oral examination (4 ECTS)

Annotation
With the Supplementary Studies on Culture and Society, KIT provides a multidisciplinary study offer as an additional qualification, with which the respective specialized study program is supplemented by interdisciplinary basic knowledge and interdisciplinary orientation knowledge in the field of cultural studies, which is becoming increasingly important for all professions.

Within the framework of the supplementary studies, students acquire in-depth knowledge of various cultural studies and interdisciplinary subject areas in the field of tension between culture, technology and society. In addition to high culture in the classical sense, other cultural practices, common values and norms as well as historical perspectives of cultural developments and influences are considered.

In the courses, conditions, procedures and concepts for the analysis and design of fundamental social development tasks are acquired on the basis of an expanded concept of culture. This includes everything created by humans - also opinions, ideas, religious or other beliefs. The aim is to develop a modern concept of cultural diversity. This includes the cultural dimension of education, science and communication as well as the preservation of cultural heritage. (UNESCO, 1982)

According to § 16 of the statutes, a reference and a certificate are issued by the ZAK for the supplementary studies. The achievements are also shown in the transcript of records of the degree program and, upon request, in the certificate. They can also be recognized in the interdisciplinary qualifications (see elective information).

Workload
The workload is made up of the recommended number of hours for the individual modules:

- basic module approx. 90 h
- in-depth module approx. 340 h
- practical module approx. 120 h

total: approx. 550 h

Learning type

- lectures
- seminars
- workshops
- practical course

Literature
Recommended reading of primary and specialized literature will be determined individually by each instructor.

M 4.45 Module: Supplementary Studies on Sustainable Development [M-ZAK-106099]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: Additional Examinations

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
19	Grade to a tenth	Each term	3 terms	German	3	1

Election notes
With the exception of the final oral exam, students have to self-record the achievements obtained in the Supplementary Studies on Sustainable Development in their study plan. ZAK records the achievements as "non-assigned" under "ÜQ/SQ-Leistungen". Further instructions on self-recording of achievements can be found in the FAQ at https://campus.studium.kit.edu/ and on the ZAK homepage at https://www.zak.kit.edu/begleitstudium-bene. The title of the examination and the amount of credits override the modules placeholders.

If you want to use ZAK achievements **both for your interdisciplinary qualifications and for the supplementary studies**, please record them in the interdisciplinary qualifications first. You can then get in contact with the ZAK study services (stg@zak.kit.edu) to also record them in your supplementary studies.

In the elective module, you need to obtain 6 credits worth of achievements in two of the four areas:

- Sustainable Cities & Neighbourhoods
- Sustainable Assessment of Technology
- Subject, Body, Individual: The Other Side of Sustainability
- Sustainability in Culture, Economy & Society

Usually, two achievements with 3 credits each have to be obtained. To self-record achievements in the elective module, you first have to elect the matching partial achievement.

Note: If you registered for the Supplementary Studies on Sustainable Development before April 1st, 2023, self-recording an achievement in this module counts as a request in the sense of §19 (2) of the regulations for the Supplementary Studies on Sustainable Development. Your overall grade for the supplementary studies will thus be calculated as the average of the examantion grades, not as the average of the module grades.

Mandatory			
T-ZAK-112345	Basics Module - Self Assignment BeNe	3 CR	Myglas
Elective Module (Election: at least 6 credits)			
T-ZAK-112347	Elective Module - Sustainable Cities and Neighbourhoods - Self Assignment BeNe	3 CR	
T-ZAK-112348	Elective Module - Sustainability Assessment of Technology - Self Assignment BeNe	3 CR	
T-ZAK-112349	Elective Module - Subject, Body, Individual: the Other Side of Sustainability - Self Assignment BeNe	3 CR	
T-ZAK-112350	Elective Module - Sustainability in Culture, Economy and Society - Self Assignment BeNe	3 CR	
Mandatory			
T-ZAK-112346	Specialisation Module - Self Assignment BeNe	6 CR	Myglas
T-ZAK-112351	Oral Exam - Supplementary Studies on Sustainable Development	4 CR	

Competence Certificate
The monitoring is explained in the respective partial achievement .

They are composed of:

- protocols
- a reflection report
- presentations
- presentations
- the elaboration of a project work
- an individual term paper

Upon successful completion of the supplementary studies, graduates receive a graded report and a certificate issued by ZAK.

Prerequisites
The course is offered during the course of study and does not have to be completed within a defined period of time. Enrolment is required for all performance assessments of the modules of the supplementary studies. Participation in the supplementary studies is regulated by § 3 of the statutes.

KIT students register for the supplementary studies by selecting this module in the student portal and self-booking a performance. Registration for courses, performance assessments and examinations is regulated by § 6 of the Statutes and is usually possible shortly before the beginning of the semester.

The course catalogue, statutes (study regulations), registration form for the oral exam and guidelines for preparing the various written performance requirements can be found as downloads on the ZAK homepage at http://www.zak.kit.edu/begleitstudium-bene.

Competence Goal
Graduates of the supplementary studies in sustainable development acquire additional practical and professional competencies. Thus, the supplementary study program enables the acquisition of basics and initial experience in project management, trains teamwork skills, presentation skills and self-reflection, and also creates a fundamental understanding of sustainability that is relevant for all professional fields.

Graduates are able to analyse social topics and problem areas and critically reflect on them in a socially responsible and sustainable perspective. They are able to place the contents selected from the modules "Elective" and "Advanced" in the basic context as well as to independently and exemplarily analyse and evaluate the contents of the selected courses and to scientifically communicate about them in written and oral form.

Content
The supplementary study program Sustainable Development can be started from the 1st semester and is not limited in time. The wide range of courses offered by ZAK makes it possible to complete the program usually within three semesters. The supplementary studies comprise 19 credit points (LP). It consists of three modules: Basic Module, Elective Module and Advanced Module.

The thematic elective areas of the supplementary studies are divided into the following 4 modules and their subtopics in Module 2 (elective module):

Block 1 **Sustainable Cities and Neighbourhoods**

The courses provide an overview of the interaction of social, ecological, and economic dynamics in the microcosm of the city.

Block 2 **Sustainability Assessment of Technology**

Mostly based on ongoing research activities, methods and approaches of technology assessment are elaborated.

Block 3 **Subject, Body, Individual: The other Side of Sustainability**

Different approaches are presented to the individual perception, experience, shaping and responsibility of relationships to the environment and to oneself.

Block 4 **Sustainability in Culture, Economy & Society**

Courses usually have an interdisciplinary approach, but may also focus on one of the areas of culture, economics or society, both in application and in theory.

The core of the supplementary studies is a case study in the specialization area. In this project seminar, students conduct sustainability research with practical relevance themselves. The case study is supplemented by an oral examination with two topics from module 2 (elective module) and module 3 (in-depth module).

Module grade calculation
The overall grade of the supplementary studies is calculated as an average of the grades of the examination performances weighted with credit points.

Elective module

- Presentation 1 (3 ECTS)
- Presentation 2 (3 ECTS)

Advanced module

- individual term paper (6 ECTS)
- oral examination (4 ECTS)

Annotation
The Supplementary Studies on Sustainable Development at KIT is based on the conviction that a long-term socially and ecologically compatible coexistence in the global world is only possible if knowledge about necessary changes in science, economy and society is acquired and applied.

The interdisciplinary and transdisciplinary Studies on Sustainable Development enables diverse access to transformation knowledge as well as basic principles and application areas of sustainable development. According to the statutes § 16, a certificate is issued by the ZAK for the complementary studies.

The achievements are also shown in the transcript of records of the degree program and, upon request, in the certificate. They can also be recognized in the interdisciplinary qualifications (see elective information).
In the specialised studies, modules and partial achievements can be recognised within the framework of the additional achievements or e.g. the interdisciplinary qualifications. This must be regulated via the respective subject study programme.

The focus is on experience- and application-oriented knowledge and competences, but theories and methods are also learned. The aim is to be able to represent one's own actions as a student, researcher and later decision-maker as well as an individual and part of society under the aspect of sustainability.

Sustainability is understood as a guiding principle to which economic, scientific, social and individual actions should be oriented. According to this, the long-term and socially just use of natural resources and the material environment for a positive development of global society can only be addressed by means of integrative concepts. Therefore, "education for sustainable development" in the sense of the United Nations programme plays just as central a role as the goal of promoting "cultures of sustainability". For this purpose, practice-centred and research-based learning of sustainability is made possible and the broad concept of culture established at ZAK is used, which understands culture as habitual behaviour, lifestyle and changing context for social actions.

The supplementary study programme conveys the basics of project management, trains teamwork skills, presentation skills and self-reflection. Complementary to the specialised studies at KIT, it creates a fundamental understanding of sustainability, which is important for all professional fields. Integrative concepts and methods are essential: in order to use natural resources in the long term and to shape the global future in a socially just way, not only different disciplines, but also citizens, practitioners and institutions must work together.

Workload
The workload is made up of the number of hours of the individual modules:

- Basic module approx. 180 h
- Elective module approx. 150 h
- Consolidation module approx. 180 h

Total: approx. 510 h

Learning type

- lectures
- seminars
- workshops

Literature
Recommended reading of primary and specialist literature is determined individually by the respective lecturer.

M 4.46 Module: Thermal Process Engineering (CIW-TVT-02) [M-CIWVT-101134]

Responsible: Prof. Dr.-Ing. Matthias Kind
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Process Engineering (Unit Operations)

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
6	Grade to a tenth	Each winter term	1 term	German	4	2

Mandatory			
T-CIWVT-101885	Thermal Process Engineering	6 CR	Kind

Competence Certificate
Sucess control is a written examination taking 120 minutes in time according to § 4 Abs. 2 SPO.

From winter term 21/22: 180 minutes.

Prerequisites
None

Competence Goal
Students can explain fundamental knowledge in the field of Thermal Separations. Emphasis is laid on the difference between methodological tools and their application for the description of selected unit operations. They can work on standard types of problems in the field of Thermal Process Engineering. They can solve it mathematically and can apply methologocal tools adequate. Furthermore, the students can quantitatively apply these tools and skills to processes and problems which are new to them.

Content
The tought methodological tools are balancing of conservative quantities, thermodynamic equilibrium and their application to single- and multi-stage processes. Within this module the following unit operations are introduced: Distillation, Rectification, Absorption, Extraction, Evaporation, Crystallisation, Drying, Adsorption/Chromatography.

Module grade calculation
The mark of the module is equal to the mark of the written examination.

Workload
Attendence time (lecture and tutorials): 56 h
Self study: 44 h
Examination preparation: 80 h

Recommendation
Courses of 1st - 4th semester

Literature
personal prints, scientific text books

M 4.47 Module: Thermodynamics I (CIW-TTK-01) [M-CIWVT-101129]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each winter term	1 term	German	3	2

Mandatory			
T-CIWVT-101878	Thermodynamics I, Tutorial	0 CR	Enders
T-CIWVT-101879	Thermodynamics I, Exam	7 CR	Enders

Competence Certificate
The learning control consists of two partial achievements:

1. Written examination lasting 120 min
2. Prerequisite for participation: Completed coursework;
   2 of 3 compulsory exercises have to be approved

Prerequisites
Before taking the written exam, the compleded coursework must be passed.

Competence Goal
Students are able to analyse and to design energy conversion processes by applying the first and second law of thermodynamics. They understand the behaviour of real pure substances, and they are able to explain thermodynamic processes with and without phase change by means of state diagrams and process schemes.

Content
Fundamental terms; thermodynamic equilibrium and temperature; properties and equation of state for ideal gases; energy and first law for closed systems; balances for open systems; entropy and thermodynamic potentials; second law; equations of state for pure component caloric properties; phase change behavior of pure component systems and state diagrams; thermodynamic cycles for power generation, refrigeration and heat pumps; exergy

Module grade calculation
The module grade is the grade of the written examination.

Workload
Lectures and exercises: 70 h
Homework: 80 h
Preparation of Examination : 60 h

Recommendation
courses of 1st and 2nd semester

Literature

- Schaber, K.: Skriptum Thermodynamik I (www.ttk.uni-karlsruhe.de)
- Stephan, P., Schaber, K., Stephan, K., Mayinger, F.: Thermodynamik, Band 1 Einstoffsysteme, 18. Aufl., Springer, 2009
- Baehr, H. D.: Thermodynamik, 11.Aufl., Springer, 2002
- Sandler, S. I.: Chemical, Biochemical and Engineering Thermodynamics, J. Wiley & Sons, 2006

M 4.48 Module: Thermodynamics II (CIW-TTK-02) [M-CIWVT-101130]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering

Credits	Grading scale	Recurrence	Duration	Language	Level	Version
7	Grade to a tenth	Each summer term	1 term	German	4	2

Mandatory			
T-CIWVT-101880	Thermodynamics II, Tutorial	0 CR	Enders
T-CIWVT-101881	Thermodynamics II, Exam	7 CR	Enders

Competence Certificate
The learning control consists of two partial achievements:

1. Written examination lasting 120 min
2. Prerequisite for participation: Completed coursework;
   2 of 3 compulsory exercises have to be approved

Prerequisites
Before taking the written exam, the compleded coursework must be passed.

Competence Goal
Students understand the behavior of real gases, gas-vapor mixtures, simple real mixtures, chemical equilibria of ideal gases. They are able to explain and to analyse corresponding thermodynamic processes by means of state diagrams and process schemes. They are able to analyse and to design these processes based on balance equations and phase equilibria.

Content
Real gases and liquification of gases; thermodynamic potentials; characterization of mixtures; mixtures of ideal gases; gas-vapor mixtures and processes with humid air; phase equilibria and phase diagrams, laws of Raoult and Henry, liquid-liquid equilibria; enthalpy of mixtures; general description of mixtures and chemical potential; reaction equilibria of ideal gases; fundamentals of combustion processes.

Module grade calculation
The module grade is the grade of the written examination.

Workload
Lectures and exercises: 70 h
Homework: 80 h
Preparation of Examination : 60 h

Recommendation
courses of 1st - 3rd semester

Thermodynamics I

Literature

- Stephan, P., Schaber, K., Stephan, K., Mayinger, F.: Thermodynamik, Band 2: Mehrstoffsysteme und chemische Reaktionen, 15. Aufl., Springer, 2010
- Baehr, H. D., Kabelac, S. : Thermodynamik, 14. Aufl., Springer, 2009
- Sandler, S. I.: Chemical, Biochemical and Engineering Thermodynamics, J. Wiley & Sons, 2006
- Gmehling, J., Kolbe, B.: Thermodynamik, 2. Auflage, VCH Verlag Weinheim, 1992

5 Courses

T 5.1 Course: Automation and Control Systems Engineering - Exam [T-CIWVT-113088]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106477 - Automation and Control Systems Engineering

Type	Credits	Grading scale	Version
Oral examination	6	Grade to a third	1

Events					
WT 23/24	2243020	Advanced Methods in Linear Control	2+1 SWS	Lecture / Practice / 🗣	Meurer
WT 23/24	2243021	Exkursion im Profilfach Automatisierungs- und Regelungstechnik	1 SWS	Excursion / 🗣	Meurer

Legend: 💻 Online, 💐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

T 5.2 Course: Advanced Mathematics I [T-MATH-100275]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-CIWVT-106447 - Orientation Exam
M-MATH-100280 - Advanced Mathematics I

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	3

Events					
WT 23/24	0131000	Höhere Mathematik I für die Fachrichtung Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture	Hettlich
WT 23/24	0131200	Höhere Mathematik I für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture	Hettlich
Exams					
ST 2023	6700025	Advanced Mathematics I			Arens, Griesmaier, Hettlich
WT 23/24	6700007	Advanced Mathematics I			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written examination of 120 minutes length.

Prerequisites
A "pass" result on the pre-requesite in AM I is a requirement for registration for the examination in AM I.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MATH-100525 - Tutorial Advanced Mathematics I must have been passed.

T 5.3 Course: Advanced Mathematics II [T-MATH-100276]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-100281 - Advanced Mathematics II

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	2

Events					
ST 2023	0180800	Höhere Mathematik II für die Fachrichtungen Maschinenbau, Geodäsie, Materialwissenschaft und Werkstofftechnik	4 SWS	Lecture	Hettlich
ST 2023	0181000	Höhere Mathematik II für die Fachrichtungen Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und MIT	4 SWS	Lecture	Hettlich
Exams					
ST 2023	6700001	Advanced Mathematics II			Arens, Griesmaier, Hettlich
WT 23/24	6700008	Advanced Mathematics II			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written examination of 120 minutes length.

Prerequisites
A "pass" result on the pre-requesite in AM II is a requirement for registration for the examination in AM II.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MATH-100526 - Tutorial Advanced Mathematics II must have been passed.

T 5.4 Course: Advanced Mathematics III [T-MATH-100277]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-100282 - Advanced Mathematics III

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	2

Events					
WT 23/24	0131400	Höhere Mathematik III für die Fachrichtungen Maschinenbau, Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und das Lehramt Maschinenbau	4 SWS	Lecture	Arens
Exams					
ST 2023	6700002	Advanced Mathematics III			Arens, Griesmaier, Hettlich
WT 23/24	6700009	Advanced Mathematics III			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written examination of 120 minutes length.

Prerequisites
A "pass" result on the pre-requesite in AM III is a requirement for registration for the examination in AM III.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-MATH-100527 - Tutorial Advanced Mathematics III must have been passed.

T 5.5 Course: Air Pollution Control [T-CIWVT-113046]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106448 - Air Pollution Control

Type	Credits	Grading scale	Recurrence	Version
Oral examination	7	Grade to a third	Each summer term	1

Events					
WT 23/24	2244020	Gas Particle Measurement Technology	2 SWS	Lecture / 🗣	Dittler
WT 23/24	2244021	Exercises on 2244020 Gas Particle Measurement Technology	1 SWS	Practice / 🗣	Dittler, und Mitarbeiter
Exams					
WT 23/24	7292917	Air Pollution Control			Dittler

Legend: 🖥 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is an oral examination lasting approx. 30 minutes.

Prerequisites
None

T 5.6 Course: Air Pollution Control - Project Work [T-CIWVT-113047]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106448 - Air Pollution Control

Type	Credits	Grading scale	Version
Examination of another type	5	Grade to a third	1

Events					
ST 2023	22977	Projektarbeit im Profilfach Partikeltechnik	2 SWS	Project / 🗣	Dittler, und Mitarbeiter
Exams					
WT 23/24	7292977	Air Pollution Control - Project Thesis			Dittler

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a project work; examination of another type.

Prerequisites
None

T 5.7 Course: Automation and Control Systems Engineering - Project Work [T-CIWVT-113089]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106477 - Automation and Control Systems Engineering

Type	Credits	Grading scale	Version
Examination of another type	6	Grade to a third	1

Events					
WT 23/24	2243020	Advanced Methods in Linear Control	2+1 SWS	Lecture / Practice / 🗣	Meurer
WT 23/24	2243021	Exkursion im Profilfach Automatisierungs- und Regelungstechnik	1 SWS	Excursion / 🗣	Meurer

Legend: 📱 Online, 💐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

T 5.8 Course: Bachelor's Thesis [T-CIWVT-113255]

Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106580 - Module Bachelor's Thesis

Type	Credits	Grading scale	Version
Final Thesis	12	Grade to a third	1

Final Thesis
This course represents a final thesis. The following periods have been supplied:

Submission deadline	4 months
Maximum extension period	1 months
Correction period	6 weeks

T 5.9 Course: Basics Module - Self Assignment BAK [T-ZAK-112653]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Completed coursework	3	pass/fail	1

Competence Certificate
The monitoring in this module includes a course credit according to § 5 section 4 in the form of minutes of which two are to be handed in freely chosen topics of the lecture series " Introduction to Applied Studies on Culture and Society ". Length: approx. 6,000 characters each (incl. spaces).

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
Fjordevik, Anneli und Jörg Roche: Angewandte Kulturwissenschaften. Vol. 10. Narr Francke Attempto Verlag, 2019.

Annotation
The Basic Module consists of the lecture “Introduction to Supplementary Studies on Culture and Society”, which is offered only in the winter semester. It is therefore recommended that students start their studies in the winter semester and complete them before module 2.

T 5.10 Course: Basics Module - Self Assignment BeNe [T-ZAK-112345]

Responsible: Christine Myglas
Organisation:
Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Completed coursework	3	pass/fail	1

Competence Certificate
The monitoring in this module includes a course credit according to § 5 section 4:

Introduction to Sustainable Development in the form of minutes of which two are to be handed in freely chosen topics of the lecture series "Introduction to Sustainable Development". Length: approx. 6,000 characters each (incl. spaces).

or

Sustainability Spring Days at KIT in the form of a reflection report on all components of the project days "Sustainability Spring Days at KIT". Length approx. 12,000 characters (incl. spaces).

Prerequisites
None

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
Kropp, Ariane: Grundlagen der Nachhaltigen Entwicklung: Handlungsmöglichkeiten und Strategien zur Umsetzung. Springer-Verlag, 2018.

Pufé, Iris: Nachhaltigkeit. 3. überarb. Edition, UTB, 2017.

Roorda, Niko, et al.: Grundlagen der nachhaltigen Entwicklung. Springer-Verlag, 2021.

Annotation
Module Basics consists of the lecture " Introduction to Sustainable Development ", which is only offered in the summer semester or alternatively of the project days " Sustainability Spring Days at KIT ", which is only offered in the winter semester. It is recommended to complete the course before Elective Module an Specialisation Module.

In exceptional cases, Elective Module or Specialisation Module can also be completed simultaneously with Basics Module. However, the prior completion of the advanced modules Elective and Specialisation should be avoided.

T 5.11 Course: Biochemistry [T-CIWVT-112997]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106414 - Biology for Engineers

Type	Credits	Grading scale	Recurrence	Version
Written examination	2,5	Grade to a third	Each summer term	1

Events					
WT 23/24	2212110	Biology for Engineers - Biochemistry	2 SWS	Lecture / 🗣	Rudat
Exams					
WT 23/24	7212110-V-BC	BING Biochemistry			Holtmann, Rudat

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Written Examination with a duration of 90 minutes; Section 4, subsection 2 No. 1 SPO.

Prerequisites
None

T 5.12 Course: Biopharmaceutical Process Engineering [T-CIWVT-113023]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106437 - Biopharmaceutical Process Engineering
M-CIWVT-106475 - Biopharmaceutical Process Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each term	1

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

T 5.13 Course: Biopharmaceutical Purification Processes [T-CIWVT-106029]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
WT 23/24	2214010	Biopharmaceutical Purification Processes	3 SWS	Lecture / 🗣	Hubbuch, Franzreb
WT 23/24	2214011	Exercises on Biopharmaceutical Purification Processes (2214010)	1 SWS	Practice / 🗣	Hubbuch, Franzreb
Exams					
ST 2023	7223011	Biopharmaceutical Purification Processes			Hubbuch
WT 23/24	7223011	Biopharmaceutical Purification Processes			Hubbuch

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The examination is a written examination with a duration of 120 minutes (section 4 subsection 2 number 1 SPO).

T 5.14 Course: Bioprocess Development [T-CIWVT-112766]

Responsible: Prof. Dr.-Ing. Alexander Grünberger
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
ST 2023	22770	Bioprocess Development	2 SWS	Lecture /	Grünberger
ST 2023	22771	Bioprocess Development - Exercises	2 SWS	Practice /	Grünberger
Exams					
ST 2023	7222001	Bioprocess Development			Grünberger
WT 23/24	7222001	Bioprocess Development			Grünberger

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 5.15 Course: Bioprocess Engineering [T-CIWVT-113019]

Responsible: Prof. Dr.-Ing. Alexander Grünberger
Prof. Dr.-Ing. Jürgen Hubbuch

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-106434 - Bioprocess Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each winter term	1

Competence Certificate
Written examination with a duration of 120 minutes (section 4 subsection 2 No. 1 SPO).

T 5.16 Course: Biotechnological Production [T-CIWVT-106030]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each summer term	2

Events					
ST 2023	22409	Übung zu 22410 Biotechnologische Stoffproduktion	2 SWS	Practice /	Ochsenreither
ST 2023	22410	Biotechnical Production Methods	2 SWS	Lecture /	Holtmann
WT 23/24	2212020	Biotechnical Production Methods	2 SWS	Lecture /	Holtmann
WT 23/24	2212021	Biotechnical Production Methods - Exercises	1 SWS	Seminar /	Holtmann
Exams					
ST 2023	7221-V-410	Biotechnological Production			Syldatk, Holtmann
WT 23/24	7212020-V-BS	Biotechnological Production			Holtmann

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
Seminar

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-108492 - Seminar Biotechnological Production must have been passed.

Recommendation
Knowledge ind biochemistry, genetics, cell biology and microbiology is required.

T 5.17 Course: Biotechnology [T-CIWVT-103669]

Responsible: Dr.-Ing. Iris Perner-Nochta
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101143 - Biotechnology

Type	Credits	Grading scale	Version
Examination of another type	9	Grade to a third	2

Events					
WT 23/24	2214210	Profile Subject Biotechnology - Management of Scientific Projects	2+1 SWS	Lecture / Practice / 🗣	Perner-Nochta, Grünberger, und Mitarbeiter
WT 23/24	2214211	Profile Subject Biotechnology - Laboratory Work (2214210)	6 SWS	Practical course / 🗣	Perner-Nochta, Grünberger, und Mitarbeiter
WT 23/24	2214212	Profile Subject Biotechnology - Exercises on Management of Scientific Projects (2214210)	1 SWS	Practice / 🗣	Perner-Nochta, und Mitarbeiter
Exams					
WT 23/24	7223002	Biotechnology			Hubbuch

Legend: 💻 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is an examination of another type, project work.

Prerequisites
None

T 5.18 Course: Biotechnology - Seminar [T-CIWVT-113097]

Responsible: Dr.-Ing. Iris Perner-Nochta
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101143 - Biotechnology

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each term	1

Events					
WT 23/24	2214214	Proseminar Biotechnology	2 SWS	Seminar / 🗣	Perner-Nochta, Bleher

Legend: 📱 Online, 🎛 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
None

T 5.19 Course: Cell Biology [T-CIWVT-111062]

Responsible: apl. Prof. Dr. Hans-Eric Gottwald
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106447 - Orientation Exam

Type	Credits	Grading scale	Recurrence	Version
Written examination	3	Grade to a third	Each winter term	1

Exams			
ST 2023	7221-V-405 ZELL	Cell Biology	Gottwald
WT 23/24	7212113-V-ZELL	BING Cell Biology	Gottwald

Competence Certificate
Written examination with a duration of 90 minutes (section 4, subsection 2 Nr. 1 SPO).

Prerequisites
None

T 5.20 Course: Cell Biology [T-CIWVT-113037]

Responsible: apl. Prof. Dr. Hans-Eric Gottwald
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106414 - Biology for Engineers

Type	Credits	Grading scale	Recurrence	Version
Written examination	2	Grade to a third	Each winter term	1

Events					
WT 23/24	2212113	Biology for Engineers - Cell Biology	2 SWS	Lecture / 🗣	Gottwald
Exams					
WT 23/24	7212113-V-ZELL	BING Cell Biology			Gottwald

Legend: 💻 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Written examination with a duration of 90 minutes (section 4, subsection 2 Nr. 1 SPO).

Prerequisites
None

T 5.21 Course: Chemical Process Engineering [T-CIWVT-101884]

Responsible: Prof. Dr.-Ing. Gregor Wehinger
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101133 - Chemical Process Engineering

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
WT 23/24	2220010	Chemical Process Engineering	2 SWS	Lecture / 🗣	Wehinger
WT 23/24	2220011	Exercises on 2220010 Chemical Process Engineering	2 SWS	Practice / 🗣	Wehinger, Kutscherauer, und Mitarbeiter
Exams					
ST 2023	7210101	Chemical Process Engineering			Müller
WT 23/24	7210101	Chemical Process Engineering			Wehinger

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

T 5.22 Course: Circular Economy - Oral Exam [T-CIWVT-112172]

Responsible: Prof. Dr.-Ing. Dieter Stapf
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-105995 - Circular Economy

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each winter term	1

Events					
WT 23/24	2232220	Circular Economy	2 SWS	Lecture / 🗣	Stapf
WT 23/24	2232221	Exercises on 2232220 Circular Economy	1 SWS	Practice / 🗣	Stapf
Exams					
ST 2023	7231003	Circular Economy - Oral Exam			Stapf

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The learning control is an oral examination on lectures, exercises and case studies, duration approx. 30 minutes.

Prerequisites
None.

T 5.23 Course: Circular Economy - Project Work [T-CIWVT-112173]

Responsible: Prof. Dr.-Ing. Dieter Stapf
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-105995 - Circular Economy

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each summer term	1

Events					
ST 2023	22537	Projektarbeit Profilfach Kreislaufwirtschaft	2 SWS	Project / 🗣	Stapf, und Mitarbeiter
Exams					
ST 2023	7231004	Circular Economy - Project Work			Stapf
WT 23/24	7231004	Circular Economy - Project Work			Stapf

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is an examination of another type. The following partial aspects are included in the grading: Term paper and presentation.

Prerequisites
None.

T 5.24 Course: Computational Fluid Dynamics [T-CIWVT-106035]

Responsible: Prof. Dr.-Ing. Hermann Nirschl
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each term	1

Events					
WT 23/24	2245020	Computational Fluid Dynamics	2 SWS	Lecture / 🗣	Nirschl, und Mitarbeiter
WT 23/24	2245021	Exercises for 2245020 Computational Fluid Dynamics	1 SWS	Practice / 🗣	Nirschl, und Mitarbeiter
Exams					
ST 2023	7291932	Computational Fluid Dynamics			Nirschl
WT 23/24	7291020	Computational Fluid Dynamics			Nirschl

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 90 minutes.

Prerequisites
None

T 5.25 Course: Control Engineering and System Dynamics [T-CIWVT-112787]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106308 - Control Engineering and System Dynamics

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	1

Events					
ST 2023	22919	Control Engineering and System Dynamics	2 SWS	Lecture / 🗣	Meurer
ST 2023	22920	Exercises on Control Engineering and System Dynamics	1 SWS	Practice / 🗣	Meurer, und Mitarbeiter
ST 2023	22923	Tutorium zu Regelungstechnik und Systemdynamik	1 SWS	Tutorial / 🗣	Meurer, und Mitarbeiter
Exams					
ST 2023	7276-T-MACH-102126	Control Engineering and System Dynamics			Stiller, Meurer
WT 23/24	7294000	Control Engineering and System Dynamics			Meurer

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

T 5.26 Course: Data Analysis [T-CIWVT-113039]

Responsible: apl. Prof. Dr. Gisela Guthausen
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106432 - Data Analysis

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	1

Prerequisites
None

T 5.27 Course: Design of Machines [T-CIWVT-103641]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101941 - Design of Machines

Type	Credits	Grading scale	Version
Completed coursework	0	pass/fail	1

Events					
ST 2023	22952	Design of Machines	4 SWS	Lecture / 🗣	Gleiß
Exams					
ST 2023	7291959	Design of Machines			Gleiß
WT 23/24	7291959	Design of Machines			Nirschl

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The Learning control is a completed coursework (ungraded).

Prerequisites
None

T 5.28 Course: Design of Machines, Exam [T-CIWVT-103642]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101941 - Design of Machines

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	1

Events					
ST 2023	22952	Design of Machines	4 SWS	Lecture / 🗣	Gleiß
Exams					
ST 2023	7291957	Apparatus Design			Gleiß
WT 23/24	7291957	Design of Machines			Gleiß

Legend: 🖥 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Written examination lasting 120 minutes.

Prerequisites
Preparatory

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-103641 - Design of Machines must have been passed.

T 5.29 Course: Elective Module - Subject, Body, Individual: the Other Side of Sustainability - Self Assignment BeNe [T-ZAK-112349]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 5.30 Course: Elective Module - Sustainability Assessment of Technology - Self Assignment BeNe [T-ZAK-112348]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 5.31 Course: Elective Module - Sustainability in Culture, Economy and Society - Self Assignment BeNe [T-ZAK-112350]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 5.32 Course: Elective Module - Sustainable Cities and Neighbourhoods - Self Assignment BeNe [T-ZAK-112347]

Organisation: University

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Examination of another kind according to § 7 section 7 in the form of a presentation in the selected course.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
The content of the Basics Module is helpful.

T 5.33 Course: Energy and Environmental Engineering [T-CIWVT-108254]

Responsible: Prof. Dr. Reinhard Rauch
Prof. Dr.-Ing. Dimosthenis Trimis

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-101145 - Energy and Environmental Engineering

Type	Credits	Grading scale	Version
Written examination	8	Grade to a third	1

Events					
WT 23/24	2231150	Verfahren zur Erzeugung chemischer Energieträger	2 SWS	Lecture / 🗣	Rauch
WT 23/24	2232050	Fundamentals of High Temperature Energy Conversion	2 SWS	Lecture / 🗣	Trimis
Exams					
ST 2023	7230500	Energy and Environmental Engineering			Trimis, Rauch

Legend: 🖥 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

T 5.34 Course: Energy and Environmental Engineering Project Work [T-CIWVT-103527]

Responsible: Prof. Dr. Reinhard Rauch
Prof. Dr.-Ing. Dimosthenis Trimis
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101145 - Energy and Environmental Engineering

Type	Credits	Grading scale	Version
Examination of another type	4	Grade to a third	1

Events					
ST 2023	22566	Projektarbeit im Profilfach Energie- und Umwelttechnik		Project / 🗣	Trimis, Rauch, Kolb
Exams					
WT 23/24	7230501	Energy and Environmental Engineering Project Work			Rauch, Trimis

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The learning control is an examination of another type; project work.

Prerequisites
None

T 5.35 Course: Energy Process Engineering [T-CIWVT-101889]

Responsible: Prof. Dr.-Ing. Thomas Kolb
Prof. Dr. Oliver Thomas Stein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101136 - Energy Process Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each term	1

Events					
WT 23/24	2232110	Energy Process Engineering	2 SWS	Lecture /	Stein, Kolb
WT 23/24	2232111	Exercises on 2232110 Energy Process Engineering	1 SWS	Practice /	Stein, Kolb, und Mitarbeiter
Exams					
ST 2023	7230110	Energy Process Engineering			Kolb, Trimis
WT 23/24	7231109	Energy Process Engineering			
WT 23/24	7231110	Energy Process Engineering			Kolb, Stein

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a written examination lasting 150 minutes.

Prerequisites
None

T 5.36 Course: Engineering Mechanics: Dynamics [T-CIWVT-106290]

Responsible: TT-Prof. Dr. Christoph Klahn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101128 - Engineering Mechanics: Dynamics

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each winter term	1

Events					
WT 23/24	2241010	Engineering Mechanics: Dynamics	2 SWS	Lecture / 🗣	Klahn
WT 23/24	2241011	Exercises on 2241010 Engineering Mechanics: Dynamics	2 SWS	Practice / 🗣	Klahn, Rentschler
WT 23/24	2241012	Tutorium zu 2241010 Technische Mechanik: Dynamik	1 SWS	Tutorial / 🗣	Klahn
Exams					
WT 23/24	7210201	Engineering Mechanics: Dynamics			Dittmeyer

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
The learning control is a completed coursework: 3 of 4 exercises have to be passed.

T 5.37 Course: Engineering Mechanics: Dynamics, Exam [T-CIWVT-101877]

Responsible: TT-Prof. Dr. Christoph Klahn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101128 - Engineering Mechanics: Dynamics

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each term	2

Events					
WT 23/24	2241010	Engineering Mechanics: Dynamics	2 SWS	Lecture / 🗣	Klahn
WT 23/24	2241011	Exercises on 2241010 Engineering Mechanics: Dynamics	2 SWS	Practice / 🗣	Klahn, Rentschler
WT 23/24	2241012	Tutorium zu 2241010 Technische Mechanik: Dynamik	1 SWS	Tutorial / 🗣	Klahn
Exams					
ST 2023	7210200	Engineering Mechanics: Dynamics, Exam			Dittmeyer
WT 23/24	7210200	Engineering Mechanics: Dynamics, Exam			Klahn

Legend: 💻 Online, 🎭 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learming control is a written examination lasting 120 minutes.

Prerequisites
Prerequisite: 3 of 4 exercises have to be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-106290 - Engineering Mechanics: Dynamics must have been passed.

T 5.38 Course: Engineering Mechanics: Statics [T-CIWVT-111054]

Responsible: Dr.-Ing. Bernhard Hochstein
Prof. Dr. Norbert Willenbacher
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-105846 - Engineering Mechanics: Statics

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each winter term	1

Events					
WT 23/24	2242210	Engineering Mechanics: Statics	2 SWS	Lecture / 🗣	Willenbacher, Hochstein, Oelschlaeger
WT 23/24	2242211	Exercises on 2242210 Engineering Mechanics: Statics	2 SWS	Practice / 🗣	Oelschlaeger, Hochstein, und Mitarbeiter
WT 23/24	2242212	Seminar zur Technischen Mechanik	2 SWS	Seminar / 🗣	Oelschlaeger, Hochstein, und Mitarbeiter
Exams					
ST 2023	7290003	Engineering Mechanics: Statics			Hochstein
WT 23/24	7290003	Engineering Mechanics: Statics			Hochstein

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
None

T 5.39 Course: Excercises: Membrane Technologies [T-CIWVT-113235]

Responsible: Prof. Dr. Harald Horn
Dr.-Ing. Florencia Saravia
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	1	pass/fail	Each summer term	1

Events					
ST 2023	22606	Membrane Technologies in Water Treatment - Excercises	1 SWS	Practice /	Horn, Saravia, und Mitarbeiter
Exams					
ST 2023	7232609	Excursions for Membrane Technologies			Horn, Saravia

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a completed coursework: Submission of exercises, membrane design and short presentation (5 minutes, group work).

T 5.40 Course: Exercises Process Development and Scale-up [T-CIWVT-111005]

Responsible: Prof. Dr.-Ing. Jörg Sauer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101153 - Process Development and Scale-up

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each winter term	1

Exams			
WT 23/24	7200027	Exercises Process Development and Scale-up	Sauer

T 5.41 Course: Fluiddynamics, Exam [T-CIWVT-101882]

Responsible: Prof. Dr.-Ing. Hermann Nirschl
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101131 - Fluiddynamics

Type	Credits	Grading scale	Version
Written examination	5	Grade to a third	1

Events					
ST 2023	22944	Fluiddynamics	3 SWS	Lecture /	Nirschl
ST 2023	22945	Practical in Fluiddynamics	1 SWS	Practice /	Nirschl
Exams					
ST 2023	7291944	Fluiddynamics			Nirschl
WT 23/24	7291944	Fluiddynamics			Nirschl

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-101904 - Fluiddynamics, Tutorial must have been passed.

T 5.42 Course: Fluiddynamics, Tutorial [T-CIWVT-101904]

Responsible: Prof. Dr.-Ing. Hermann Nirschl
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101131 - Fluiddynamics

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

Events					
ST 2023	22944	Fluiddynamics	3 SWS	Lecture / 🗣	Nirschl
ST 2023	22945	Practical in Fluiddynamics	1 SWS	Practice / 🗣	Nirschl
Exams					
ST 2023	7291943	Fluiddynamics, Tutorial			Nirschl
WT 23/24	7291943	Fluiddynamics, Tutorial			Nirschl

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a completed coursework.

T 5.43 Course: Food Bioprocess Engineering [T-CIWVT-113021]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106436 - Food Bioprocess Engineering
M-CIWVT-106476 - Food Bioprocess Engineering

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each winter term	1

Competence Certificate
This module is sucessfully completed by a written exam of 120 min.

Prerequisites
Keine.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-113041 - Food Bioprocess Engineering - Prerequisite must have been passed.

T 5.44 Course: Food Bioprocess Engineering - Prerequisite [T-CIWVT-113041]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106436 - Food Bioprocess Engineering
M-CIWVT-106476 - Food Bioprocess Engineering

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each winter term	1

Prerequisites
none

T 5.45 Course: Food Bioprocess Engineering Lab [T-CIWVT-113022]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106436 - Food Bioprocess Engineering

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	3	Grade to a third	Each winter term	1

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-113041 - Food Bioprocess Engineering - Prerequisite must have been passed.

T 5.46 Course: Food Technology [T-CIWVT-103528]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101148 - Food Technology

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	2

Events					
ST 2023	22231	Übung zu 22232	1 SWS	Practice / 🗣	Karbstein, und Mitarbeiter
ST 2023	22252	Exkursion im Profilfach Lebensmitteltechnologie	1 SWS	Excursion / 🗣	Karbstein, und Mitarbeiter
WT 23/24	2211040	Einführung in das Profilfach Lebensmitteltechnologie	1 SWS	Lecture / 🗣	Karbstein, Ellwanger, und Mitarbeiter
WT 23/24	2211041		1 SWS	Project / 🗣	Karbstein, Ellwanger, und Mitarbeiter
Exams					
WT 23/24	7220010	Food Technology			Karbstein

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination with a duration of 60 minutes.

Prerequisites
None.

T 5.47 Course: Food Technology Project Work [T-CIWVT-103529]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101148 - Food Technology

Type	Credits	Grading scale	Version
Examination of another type	7	Grade to a third	1

Events					
ST 2023	22232	Projektarbeit im Profilfach Lebensmitteltechnologie	4 SWS	Project / 🗣	Karbstein, und Mitarbeiter
Exams					
WT 23/24	7220011	Food Technology Project Work			Karbstein

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a projekt work/ examination of another type.

Prerequisites
None

T 5.48 Course: Fundamentals of Heat and Mass Transfer [T-CIWVT-101883]

Responsible: Prof. Dr.-Ing. Wilhelm Schabel
Prof. Dr.-Ing. Thomas Wetzel

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-101132 - Fundamentals of Heat and Mass Transfer

Type	Credits	Grading scale	Recurrence	Version
Written examination	7	Grade to a third	Each term	1

Events					
ST 2023	22830	Wärme- und Stoffübertragung	3 SWS	Lecture / 🗣	Wetzel, Schabel
ST 2023	22831	Übung zu Wärme- und Stoffübertragung (22830)	2 SWS	Practice / 🗣	Wetzel, Schabel, und Mitarbeiter
Exams					
ST 2023	7280001	Fundamentals of Heat and Mass Transfer			Wetzel, Schabel
WT 23/24	7280001	Fundamentals of Heat and Mass Transfer			Wetzel, Schabel

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 180 minutes.

Prerequisites
None

T 5.49 Course: Fundamentals of Refrigeration, Oral Examination [T-CIWVT-109117]

Responsible: Prof. Dr.-Ing. Steffen Grohmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-104457 - Fundamentals of Refrigeration

Type	Credits	Grading scale	Recurrence	Version
Oral examination	6	Grade to a third	Each summer term	3

Events					
WT 23/24	2250110	Refrigeration A	2 SWS	Lecture / 🗣	Grohmann
WT 23/24	2250111	Refrigeration A - Exercises	1 SWS	Practice / 🗣	Grohmann, und Mitarbeiter
Exams					
ST 2023	7200005	Fundamentals of Refrigeration, oral examination			Grohmann
WT 23/24	7250110	Fundamentals of Refrigeration, oral examination			Grohmann

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning Control is an oral examination about the lecture "Grundlagen der Kältetechnik" lasting approx. 30 minutes.

Prerequisites
Projects Work

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-109118 - Fundamentals of Refrigeration, Project Work must have been started.

T 5.50 Course: Fundamentals of Refrigeration, Project Work [T-CIWVT-109118]

Responsible: Prof. Dr.-Ing. Steffen Grohmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-104457 - Fundamentals of Refrigeration

Type	Credits	Grading scale	Version
Examination of another type	6	Grade to a third	1

Events					
ST 2023	22046	Projektarbeit zum Profilfach Thermodynamik und Kältetechnik	2 SWS	Practice / 🗣	Grohmann
Exams					
ST 2023	7200006	Fundamentals of Refrigeration, Project Work			Grohmann
WT 23/24	7250112	Fundamentals of Refrigeration, Project Work			Grohmann

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
Learning control is a completed coursework: groupwork, project presentation.

Prerequisites
None

T 5.51 Course: General Chemistry and Chemistry of Aqueous Solutions [T-CIWVT-101892]

Responsible: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106431 - General Chemistry and Chemistry of Aqueous Solutions

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each winter term	1

Events					
WT 23/24	2233050	General Chemistry and Chemistry in Aqueous Solutions	3 SWS	Lecture / 🗣	Horn
WT 23/24	2233051	Excercises to 2233050: General Chemistry and Chemistry in Aqueous Solutions	2 SWS	Practice / 🗣	Horn, Guthausen, Wagner
WT 23/24	2233052	Tutorial A to 2233050: General Chemistry and Chemistry in Aqueous Solutions	2 SWS	Tutorial / 🗣	Guthausen, Wagner
WT 23/24	2233053	Tutorial B to 2233050: General Chemistry and Chemistry in Aqueous Solutions	2 SWS	Tutorial / 🗣	Guthausen, Wagner
Exams					
WT 23/24	7232667	General Chemistry and Chemistry of Aqueous Solutions			Horn, Guthausen
WT 23/24	7232668	General Chemistry and Chemistry of Aqueous Solutions			Horn, Guthausen

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a written exam lasting 150 minutes to lecture " General Chemistry and Chemistry of Aqueous Solutions" (lecture 3 SWS, exercises 2 SWS).

Prerequisites
None

T 5.52 Course: Genetics [T-CIWVT-111063]

Responsible: Dr. Anke Neumann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106414 - Biology for Engineers
M-CIWVT-106447 - Orientation Exam

Type	Credits	Grading scale	Recurrence	Version
Written examination	2	Grade to a third	Each winter term	1

Exams			
ST 2023	7221-V-405 GEN	Genetics	Neumann
WT 23/24	7212114-V-GEN	Genetics	Neumann

Competence Certificate
Written examination with a duration of 90 minutes (section 4 subsection 2 No. 1 SPO).

Prerequisites
None

T 5.53 Course: In-depth Module - Doing Culture - Self Assignment BAK [T-ZAK-112655]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 5.54 Course: In-depth Module - Global Cultures - Self Assignment BAK [T-ZAK-112658]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 5.55 Course: In-depth Module - Media & Aesthetics - Self Assignment BAK [T-ZAK-112656]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 5.56 Course: In-depth Module - Spheres of Life - Self Assignment BAK [T-ZAK-112657]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 5.57 Course: In-depth Module - Technology & Responsibility - Self Assignment BAK [T-ZAK-112654]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
At least two presentations must be given: An examination of another kind according to § 5 section 3 (3) in the form of a presentation in one of the chosen courses (3 ECT).
In a third seminar, either (a) a presentation is held (preliminary study achievement) which remains not graded and a topic-related term paper is submitted or (b) a written exam is taken.
The three courses can be selected individually from the 5 thematic blocks or – in exceptional cases and according to the agreement with the responsible lecturer – all three courses can be selected from one block in the sense of a specialization.
In addition, an oral examination is taken, which relates to the content of two of the chosen three courses.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Annotation
The content of the Basic Modul is helpful.

T 5.58 Course: Industrial Organic Chemistry [T-CIWVT-101890]

Responsible: Prof. Dr. Reinhard Rauch
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101137 - Industrial Organic Chemistry

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each term	1

Events					
WT 23/24	2231140	Organic Chemical Process Science	3 SWS	Lecture / 🗣	Rauch
WT 23/24	2231141	Exercises on 2231140 Organical Chemical Process Science	1 SWS	Practice / 🗣	Rauch
Exams					
ST 2023	7223703	Industrial Organic Chemistry			Wörner, Rauch
WT 23/24	7223703	Industrial Organic Chemistry			Rauch

Legend: 💻 Online, 🎭 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-CHEMBIO-101115 - Organic Chemistry for Engineers must have been started.

T 5.59 Course: Initial Exam Process Technology and Plant Design [T-CIWVT-106149]

Responsible: Prof. Dr.-Ing. Thomas Kolb
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each winter term	1

Events					
WT 23/24	2231010	Process Technology and Plant Design I	2 SWS	Lecture / 🗣	Kolb, Bajohr
WT 23/24	2231012	Practical Course Process Technology and Plant Design	1 SWS	Practical course / 🗣	Kolb, und Mitarbeiter
Exams					
WT 23/24	7230100				Kolb
WT 23/24	7230100-2	Initial Exam Process Technology and Plant Design			Kolb

Legend: 🖥 Online, 🌍 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Completed coursework; ungraded exam

Prerequisites
None

T 5.60 Course: Intensification of Bioprocesses - Written Exam [T-CIWVT-112998]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106416 - Intensification of Bioprocesses
M-CIWVT-106444 - Intensification of Bioprocesses

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

T 5.61 Course: Intensivication of Bioprocesses - Lab [T-CIWVT-112999]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Dr. Anke Neumann

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-106416 - Intensification of Bioprocesses

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

T 5.62 Course: Internship [T-CIWVT-106036]

Responsible: Dr.-Ing. Siegfried Bajohr
Dr.-Ing. Barbara Freudig
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Version
Completed coursework	14	pass/fail	1

Exams			
WT 23/24	7200000	Internship	Bajohr

T 5.63 Course: Introduction into Bioengineering [T-CIWVT-113018]

Responsible: Prof. Dr.-Ing. Alexander Grünberger
Prof. Dr.-Ing. Dirk Holtmann
Prof. Dr.-Ing. Jürgen Hubbuch
Prof. Dr.-Ing. Heike Karbstein

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-106433 - Introduction into Bioengineering

Type	Credits	Grading scale	Version
Written examination	5	Grade to a third	1

Prerequisites
None

T 5.64 Course: Kinetics and Catalysis [T-CIWVT-106032]

Responsible: Prof. Dr.-Ing. Gregor Wehinger
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each term	1

Events					
ST 2023	22119	Kinetik und Katalyse	2 SWS	Lecture / ✕	
ST 2023	22120	Übung zu Kinetik und Katalyse (22119)	1 SWS	Practice / ✕	
Exams					
ST 2023	7210102	Kinetics and Catalysis			Müller
WT 23/24	7210102	Kinetics and Catalysis			Wehinger, Müller

Legend: Online, Blended (On-Site/Online), On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 60 minutes.

Prerequisites
None

T 5.65 Course: Laboratory Work: Downstream Processing [T-CIWVT-113024]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106437 - Biopharmaceutical Process Engineering

Type	Credits	Grading scale	Version
Examination of another type	3	Grade to a third	1

Competence Certificate
Learning control is an examination of another type.

Prerequisites
None

T 5.66 Course: Laboratory Work: General Chemistry [T-CIWVT-113015]

Responsible: Dr. Gudrun Abbt-Braun
Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106427 - Basic Practical Course in Natural Sciences

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	2	pass/fail	Each winter term	1

Events					
WT 23/24	2233054	Naturwissenschaftliches Grundpraktikum - Teil I: Allgemeine Chemie	2 SWS	Practical course / 🗣	Horn, Abbt-Braun
Exams					
WT 23/24	7233054	Laboratory Work: General Chemistry			Horn, Abbt-Braun

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
Written exam "General Chemistry and Chemistry of Aqueous Solutions" must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-101892 - General Chemistry and Chemistry of Aqueous Solutions must have been passed.

T 5.67 Course: Laboratory Work: Microbiology for Engineers [T-CIWVT-113014]

Responsible: Dr. Anke Neumann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106427 - Basic Practical Course in Natural Sciences

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	2	pass/fail	Each winter term	1

Events					
WT 23/24	2212150	Naturwissenschaftliches Grundpraktikum - Teil II: Mikrobiologie	2 SWS	Practical course / 🗣	Neumann
Exams					
WT 23/24	7212150-GP2-MIBI	Laboratory Work: Microbiology for Engineers			Neumann

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
The written exam General Chemistry and Chemistry in Aqueous Solutions must be passed.

The General Chemistry Lab must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-101892 - General Chemistry and Chemistry of Aqueous Solutions must have been passed.

T 5.68 Course: Mathematical Modeling for Biochemical Engineering [T-MATH-113040]

Responsible: PD Dr. Gudrun Thäter
Organisation: KIT Department of Mathematics
Part of: M-MATH-106443 - Mathematical Modeling for Biochemical Engineering

Type	Credits	Grading scale	Version
Examination of another type	4	Grade to a third	1

T 5.69 Course: Mechanical Processing [T-CIWVT-101886]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101135 - Mechanical Processing

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each term	1

Events					
WT 23/24	2244010	Mechanical Processing	2 SWS	Lecture / 🗣	Dittler
WT 23/24	2244011	Exercises on 2244010 Mechanical Processing	2 SWS	Practice / 🗣	Dittler, und Mitarbeiter
Exams					
ST 2023	7292901	Mechanical Processing			Dittler
WT 23/24	7292901	Mechanical Processing			Dittler

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

T 5.70 Course: Mechanical Separation Technology Exam [T-CIWVT-103448]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101147 - Mechanical Separation Technology

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each summer term	1

Events					
WT 23/24	2245230	Mechanical Separation Technology	3 SWS	Lecture / 🗣	Gleiß
WT 23/24	2245231	Exercises for 2245230 Mechanical Separation Technology	1 SWS	Practice / 🗣	Gleiß
Exams					
WT 23/24	7291231	Mechanical Separation Technology Exam			Gleiß

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is an oral examination lasting approx. 30 minutes.

Prerequisites
None

T 5.71 Course: Mechanical Separation Technology Project Work [T-CIWVT-103452]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101147 - Mechanical Separation Technology

Type	Credits	Grading scale	Version
Examination of another type	4	Grade to a third	1

Events					
ST 2023	22972	Project Work for Profile Subject Mechanical Separation Techniques	1 SWS	Practice / 🗣	Gleiß, und Mitarbeiter
Exams					
WT 23/24	7291300	Mechanical Separation Technology Project Work			Gleiß

Legend: 💻 Online, 🔀 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a project work; examination of another type.

Prerequisites
none

T 5.72 Course: Membrane Technologies in Water Treatment [T-CIWVT-113236]

Responsible: Prof. Dr. Harald Horn
Dr.-Ing. Florencia Saravia
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	5	Grade to a third	Each summer term	1

Events					
ST 2023	22605	Membrane Technologies in Water Treatment	2 SWS	Lecture / 🗣	Horn, Saravia
ST 2023	22606	Membrane Technologies in Water Treatment - Excercises	1 SWS	Practice / 🧩	Horn, Saravia, und Mitarbeiter
Exams					
ST 2023	7232605	Membrane Technologies in Water Treatment			Horn, Saravia
WT 23/24	7232605	Membrane Technologies in Water Treatment			Horn, Saravia

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is an written examination lasting 90 minutes.

Prerequisites
Prerequisite: Submission of exercises, membrane design and short presentation (5 minutes, group work).

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-113235 - Excercises: Membrane Technologies must have been passed.

T 5.73 Course: Micro Process Engineering [T-CIWVT-103666]

Responsible: Prof. Dr.-Ing. Peter Pfeifer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101154 - Micro Process Engineering

Type	Credits	Grading scale	Recurrence	Version
Oral examination	7	Grade to a third	Each summer term	1

Events					
WT 23/24	2220220	Design of Micro Reactors	4 SWS	Lecture / Practice /	Pfeifer
Exams					
ST 2023	7210201	Micro Process Engineering			Pfeifer

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Die Erfolgskontrolle ist eine mündliche Einzelprüfung nach § 4 Abs. 2 Nr. 2 der SPO Bachelor Bioingenieurwesen 2015 im Umfang von ca. 25 Minuten zu Lehrveranstaltung "Auslegung von Mikroreaktoren".

Prerequisites
None

T 5.74 Course: Micro Process Engineering [T-CIWVT-103667]

Responsible: Prof. Dr.-Ing. Peter Pfeifer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101154 - Micro Process Engineering

Type	Credits	Grading scale	Version
Examination of another type	5	Grade to a third	1

Events					
ST 2023	22138	Projektarbeit im Profilfach Mikroverfahrenstechnik	2 SWS	Practice / 🗣	Pfeifer, und Mitarbeiter
Exams					
ST 2023	7210202	Micro Process Engineering			Pfeifer

Legend: 💻 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Die Erfolgskontrolle ist eine Prüfungsleistung anderer Art (Projektarbeit) nach § 4 Abs. 2 Nr. 3 der SPO Bachelor Bioingenieurwesen 2015. Es werden die praktische Mitarbeit, der schriftliche Bericht sowie die mündliche Präsentation der Ergebnisse individuell bewertet.

Prerequisites
None

T 5.75 Course: Microbiology [T-CIWVT-113038]

Responsible: Dr. Anke Neumann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106414 - Biology for Engineers

Type	Credits	Grading scale	Recurrence	Version
Written examination	2,5	Grade to a third	Each winter term	1

Events					
WT 23/24	2212112	Biology for Engineers - Microbiology	2 SWS	Lecture / 🗣	Neumann
Exams					
WT 23/24	7212112-V-MIBI	BING Microbiology			Neumann, Holtmann

Legend: 📱 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Written Examination with a duration of 90 minutes.

T 5.76 Course: Oral Exam - Supplementary Studies on Culture and Society [T-ZAK-112659]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Oral examination	4	Grade to a third	1

Exams			
ST 2023	1200059	Oral Exam - Supplementary Studies on Culture and Society	

Competence Certificate
An oral examination according to § 7 section 6 of approx. 45 minutes on the contents of two courses from In-depth Module.

Prerequisites
Prerequisite for the 'Oral Examination' is the successful completion of Modules 1 and 3 and the required elective sections in Module 2.

T 5.77 Course: Oral Exam - Supplementary Studies on Sustainable Development [T-ZAK-112351]

Organisation:

Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Oral examination	4	Grade to a third	1

Exams			
ST 2023	1200018	Oral Exam - Supplementary Studies on Sustainable Development	
ST 2023	1200058	Oral Exam - Supplementary Studies on Sustainable Development	

Competence Certificate
An oral examination according to § 7 section 6 of approx. 45 minutes on the contents of two courses from Elective Module.

Prerequisites
A requirement for the Supplementary Course: Oral examination is the successful completion of the modules Basics Module and Specialisation Module and the required electives of Elective Module.

T 5.78 Course: Organic Chemistry for Engineers [T-CHEMBIO-101865]

Responsible: Prof. Dr. Michael Meier
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CHEMBIO-101115 - Organic Chemistry for Engineers

Type	Credits	Grading scale	Version
Written examination	5	Grade to a third	2

Events					
ST 2023	5142	Organische Chemie für CIW/VT und BIW	2 SWS	Lecture / 🗣	Levkin
ST 2023	5143	Übungen zu Organische Chemie für CIW/VT und BIW	2 SWS	Practice / 🗣	Levkin
Exams					
ST 2023	7100017	Organic Chemistry for CIW, BIW, VT und MWT			Levkin, Podlech
ST 2023	7100029	Organic Chemistry for CIW, BIW, VT und MWT, second exam			Levkin, Podlech
WT 23/24	7100023	Organic Chemistry for Engineers			Meier

Legend: 💻 Online, 🎛 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
acc. to module catalogue

T 5.79 Course: Particle Technology Exam [T-CIWVT-106028]

Responsible: Prof. Dr.-Ing. Achim Dittler
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
ST 2023	22975	Partikeltechnik	2 SWS	Lecture / 🗣	Dittler
ST 2023	22976	Übungen in kleinen Gruppen zu 22975 Partikeltechnik	1 SWS	Practice / 🗣	Dittler, und Mitarbeiter
Exams					
ST 2023	7292975	Particle Technology Exam			Dittler
WT 23/24	7292975	Particle Technology Exam			Dittler

Legend: 📱 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

T 5.80 Course: Physical Chemistry (Lab) [T-CHEMBIO-109179]

Responsible: Dr. Tomas Kubar
Dr. Benno Meier
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	2	pass/fail	Each winter term	1

Events					
WT 23/24	5209	Physical Chemistry for Chemical Engineers	2 SWS	Lecture	Meier, Kubar
WT 23/24	5210	Übungen zur Vorlesung Physikalische Chemie für Chemieingenieure	1 SWS	Practice	Meier, Kubar, Assistenten
WT 23/24	5239	Physikalisch-chemisches Praktikum für Chemieingenieure (Master)	2 SWS	Practical course	Bickel, Die Dozenten des Instituts
Exams					
WT 23/24	718200004P	Physical Chemistry (lab)			Bickel

Competence Certificate
The examination consists of two Parts:

1. written examination with a duration of 90 minutes (section 4 subsection 2 number 1 SPO)
2. practical course, ungraded study achievement (§ 4 Abs. 3 SPO)

Prerequisites
None

T 5.81 Course: Physical Chemistry (Written Exam) [T-CHEMBIO-109178]

Responsible: Dr. Tomas Kubar
Dr. Benno Meier
Organisation: KIT Department of Chemistry and Biosciences
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	4	Grade to a third	Each winter term	2

Events					
WT 23/24	5209	Physical Chemistry for Chemical Engineers	2 SWS	Lecture	Meier, Kubar
WT 23/24	5210	Übungen zur Vorlesung Physikalische Chemie für Chemieingenieure	1 SWS	Practice	Meier, Kubar, Assistenten
WT 23/24	5239	Physikalisch-chemisches Praktikum für Chemieingenieure (Master)	2 SWS	Practical course	Bickel, Die Dozenten des Instituts
Exams					
ST 2023	718200104	Physical Chemistry (written exam)			Meier, Kubar
WT 23/24	71000152_2	Physical Chemistry II (Written Exam)			
WT 23/24	718200004	Physical Chemistry (written exam)			Kubar, Meier, Nattland

Competence Certificate
The examination is a written examination with a duration of 90 minutes (section 4 subsection 2 number 1 SPO).

Prerequisites
Lab work has to be passed.

T 5.82 Course: Practical Course Process Technology and Plant Design [T-CIWVT-106148]

Responsible: Prof. Dr.-Ing. Thomas Kolb
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (practical)	0	pass/fail	Each winter term	1

Events					
WT 23/24	2231012	Practical Course Process Technology and Plant Design	1 SWS	Practical course / 🗣	Kolb, und Mitarbeiter
Exams					
WT 23/24	7230101	practical course Process Technology and Plant Design			Kolb

Legend: 💻 Online, 🎭 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Compleded coursework/ practical course

Prerequisites
Ungraded exam

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-106149 - Initial Exam Process Technology and Plant Design must have been passed.

T 5.83 Course: Practice Module [T-ZAK-112660]

Responsible: Dr. Christine Mielke
Christine Myglas

Organisation:

Part of: M-ZAK-106235 - Supplementary Studies on Culture and Society

Type	Credits	Grading scale	Version
Completed coursework	4	pass/fail	1

Competence Certificate
Internship (3 ECT)
Report within the framework of the practical training (Length approx. 18,000 characters (incl. spaces)
(1 ECT)

Prerequisites
none

Annotation
Knowledge from the Basic Module and the Elective Module is helpful.

T 5.84 Course: Process Development and Scale-up [T-CIWVT-103530]

Responsible: Prof. Dr.-Ing. Jörg Sauer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101153 - Process Development and Scale-up

Type	Credits	Grading scale	Recurrence	Version
Oral examination	8	Grade to a third	Each summer term	2

Events					
WT 23/24	2231310	Process Development and Scale-Up	2 SWS	Lecture / 🗣	Sauer
WT 23/24	2231311	Exercises on 2231310 Process Development and Scale-Up	2 SWS	Practice / 🗣	Sauer, und Mitarbeiter
Exams					
ST 2023	7200025	Process Development and Scale-up			Sauer

Legend: 💻 Online, 💐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-111005 - Exercises Process Development and Scale-up must have been passed.

T 5.85 Course: Process Development and Scale-up Project Work [T-CIWVT-103556]

Responsible: Prof. Dr.-Ing. Jörg Sauer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101153 - Process Development and Scale-up

Type	Credits	Grading scale	Recurrence	Version
Examination of another type	4	Grade to a third	Each summer term	1

Events					
ST 2023	22318	Presentation Profile Course "Process Development and Scale-up"		Lecture / 🗣	Sauer
ST 2023	22335	Project Work in the Profile Course "Process Development and Scale-up"	2 SWS	Project / 🗣	Sauer, und Mitarbeiter
Exams					
ST 2023	7200026	Process Development and Scale-up Project Work			Sauer

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
none

T 5.86 Course: Process Technology and Plant Design Written Exam [T-CIWVT-106150]

Responsible: Prof. Dr.-Ing. Thomas Kolb
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	8	Grade to a third	Each term	1

Events					
ST 2023	22302	Prozess - und Anlagentechnik II - Prozesse	3 SWS	Lecture / 🗣	Kolb, Bajohr
WT 23/24	2231010	Process Technology and Plant Design I	2 SWS	Lecture / 🗣	Kolb, Bajohr
WT 23/24	2231012	Practical Course Process Technology and Plant Design	1 SWS	Practical course / 🗣	Kolb, und Mitarbeiter
Exams					
ST 2023	7230102	Process Technology and Plant Design Written Exam			Kolb
WT 23/24	7230102	Process Technology and Plant Design Written Exam			Kolb

Legend: 💻 Online, 🎲 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 180 minutes.

Prerequisites
None

T 5.87 Course: Programming and Numeric Simulation Using MATLAB [T-CIWVT-113025]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106438 - Programming and Numeric Simulation Using MATLAB

Type	Credits	Grading scale	Version
Completed coursework	1	pass/fail	1

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-113074 - Programming and Numeric Simulation Using MATLAB - Ecercises must have been passed.

T 5.88 Course: Programming and Numeric Simulation Using MATLAB - Ecercises [T-CIWVT-113074]

Responsible: Prof. Dr.-Ing. Thomas Meurer
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-106438 - Programming and Numeric Simulation Using MATLAB

Type	Credits	Grading scale	Version
Completed coursework	2	pass/fail	1

T 5.89 Course: Scientific Writing with LaTeX [T-HOC-113121]

Responsible: Andreas Hirsch-Weber
Organisation:
Part of: M-HOC-106502 - Scientific Writing with LaTeX

Type	Credits	Grading scale	Version
Completed coursework	2	pass/fail	1

T 5.90 Course: Selected Formulation Technologies [T-CIWVT-106037]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Nico Leister
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
ST 2023	22209		1 SWS	Lecture / 🗣	van der Schaaf
ST 2023	22226	Trocknen von Dispersionen	1 SWS	Lecture / 🗣	Karbstein, Leister
ST 2023	22229		2 SWS	Lecture / 🗣	Karbstein, Leister
Exams					
ST 2023	7220012	Selected Formulation Technologies			Karbstein
WT 23/24	7220012	Selected Formulation Technologies			Karbstein

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 120 minutes.

Prerequisites
None

T 5.91 Course: Seminar Biotechnological Production [T-CIWVT-108492]

Responsible: Prof. Dr.-Ing. Dirk Holtmann
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Completed coursework	0	pass/fail	Each summer term	1

Events					
ST 2023	22409	Übung zu 22410 Biotechnologische Stoffproduktion	2 SWS	Practice / 🗣	Ochsenreither
ST 2023	22410	Biotechnical Production Methods	2 SWS	Lecture / 💻	Holtmann
WT 23/24	2212020	Biotechnical Production Methods	2 SWS	Lecture / 🗣	Holtmann
WT 23/24	2212021	Biotechnical Production Methods - Exercises	1 SWS	Seminar / 🗣	Holtmann
Exams					
ST 2023	7221-S-409	Seminar Biotechnological Production			Syldatk, Holtmann
WT 23/24	7212021-Ü-BS	Seminar Biotechnological Production			Syldatk

Legend: 💻 Online, Blended (On-Site/Online), 🗣 On-Site, × Cancelled

Competence Certificate
Conpleted coursework: Seminar talk.

Prerequisites
None

T 5.92 Course: Specialisation Module - Self Assignment BeNe [T-ZAK-112346]

Responsible: Christine Myglas
Organisation:
Part of: M-ZAK-106099 - Supplementary Studies on Sustainable Development

Type	Credits	Grading scale	Version
Examination of another type	6	Grade to a third	1

Competence Certificate
The monitoring occurs in the form of several supplementary courses, which usually comprise a presentation of the (group) project, a written elaboration of the (group) project as well as an individual term paper, if necessary with appendices (examination performances of other kind according to statutes § 5 section 3 No. 3 or § 7 section 7).

The presentation is usually with the accompanying practice partners, as well as the written paper.

Prerequisites
Active participation in all three mandatory components.

Self service assignment of supplementary stdues
This course can be used for self service assignment of grade aquired from the following study providers:

- Zentrum für Angewandte Kulturwissenschaft und Studium Generale
- ZAK Begleitstudium

Recommendation
Knowledge from 'Basic Module ' and 'Elective Module ' is helpful.

T 5.93 Course: Thermal Process Engineering [T-CIWVT-101885]

Responsible: Prof. Dr.-Ing. Matthias Kind
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101134 - Thermal Process Engineering

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
WT 23/24	2260110	Thermal Process Engineering	2 SWS	Lecture /	Kind, Dietrich
WT 23/24	2260111	Exercises for 2260110 Thermal Process Engineering	2 SWS	Practice /	Kind, Dietrich, und Mitarbeiter
Exams					
ST 2023	7280002	Thermal Process Engineering			Kind
WT 23/24	7280002	Thermal Process Engineering			Kind

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

T 5.94 Course: Thermal Transport Processes [T-CIWVT-106034]

Responsible: Prof. Dr.-Ing. Matthias Kind
Prof. Dr.-Ing. Wilhelm Schabel
Prof. Dr.-Ing. Thomas Wetzel

Organisation: KIT Department of Chemical and Process Engineering

Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Recurrence	Version
Written examination	6	Grade to a third	Each term	1

Events					
ST 2023	22824	Thermische Transportprozesse (MA)	2 SWS	Lecture / 🗣	Kind, Wetzel
ST 2023	22825	Übung zu 22824 Thermische Transportprozesse	2 SWS	Practice / 🗣	Wetzel, Kind, Schabel, und Mitarbeiter
Exams					
ST 2023	7280011	Thermal Transport Processes			Kind
WT 23/24	7280011	Thermal Transport Processes			Kind, Wetzel

Legend: 🖥 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lasting 180 minutes.

Prerequisites
None

T 5.95 Course: Thermodynamics I, Exam [T-CIWVT-101879]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101129 - Thermodynamics I

Type	Credits	Grading scale	Version
Written examination	7	Grade to a third	1

Events					
WT 23/24	2250010	Thermodynamics I	3 SWS	Lecture / 🗣	Enders
WT 23/24	2250011	Thermodynamics I - Exercises	2 SWS	Practice / 🗣	Enders, und Mitarbeiter
WT 23/24	2250022	Tutorial Thermodynamics I and II	2 SWS	Tutorial / 🗣	Enders, und Mitarbeiter
Exams					
ST 2023	7200002	Thermodynamics I Exam			Enders
WT 23/24	7200002	Thermodynamics I Exam			Enders

Legend: 💻 Online, 🖧 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Competence Certificate
Learning control is a written examination lastin 120 minutes.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-101878 - Thermodynamics I, Tutorial must have been passed.

T 5.96 Course: Thermodynamics I, Tutorial [T-CIWVT-101878]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101129 - Thermodynamics I

Type	Credits	Grading scale	Version
Completed coursework	0	pass/fail	1

Events					
WT 23/24	2250010	Thermodynamics I	3 SWS	Lecture / 🗣	Enders
WT 23/24	2250011	Thermodynamics I - Exercises	2 SWS	Practice / 🗣	Enders, und Mitarbeiter
WT 23/24	2250022	Tutorial Thermodynamics I and II	2 SWS	Tutorial / 🗣	Enders, und Mitarbeiter
Exams					
WT 23/24	7200001	Thermodynamics I, Tutorial			Enders

Legend: 💻 Online, 🌐 Blended (On-Site/Online), 🗣 On-Site, ✕ Cancelled

Prerequisites
None

T 5.97 Course: Thermodynamics II, Exam [T-CIWVT-101881]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101130 - Thermodynamics II

Type	Credits	Grading scale	Version
Written examination	7	Grade to a third	1

Events					
ST 2023	22004	Technische Thermodynamik II	3 SWS	Lecture /	Enders
ST 2023	22005	Übungen zu 22004 Technische Thermodynamik II	2 SWS	Practice /	Enders, und Mitarbeiter
ST 2023	22007	Tutorium Technische Thermodynamik II	2 SWS	Tutorial /	Enders, und Mitarbeiter, Bergmann, Rees
Exams					
ST 2023	7200004	Thermodynamics II, Exam			Enders
WT 23/24	7200004	Thermodynamics II, Exam			Enders

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a written examination lastin 120 minutes.

Prerequisites
Precondition for participation: 2 of 3 compulsory exercises have to be approved

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-101880 - Thermodynamics II, Tutorial must have been passed.

T 5.98 Course: Thermodynamics II, Tutorial [T-CIWVT-101880]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101130 - Thermodynamics II

Type	Credits	Grading scale	Version
Completed coursework	0	pass/fail	1

Events					
ST 2023	22004	Technische Thermodynamik II	3 SWS	Lecture /	Enders
ST 2023	22005	Übungen zu 22004 Technische Thermodynamik II	2 SWS	Practice /	Enders, und Mitarbeiter
ST 2023	22007	Tutorium Technische Thermodynamik II	2 SWS	Tutorial /	Enders, und Mitarbeiter, Bergmann, Rees
Exams					
ST 2023	7200003	Thermodynamics II, Tutorial			Enders

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
The learning control is a completed coursework; prerequisite for the written exam.

Prerequisites
None

T 5.99 Course: Thermodynamics III [T-CIWVT-106033]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101991 - Single Results

Type	Credits	Grading scale	Version
Written examination	6	Grade to a third	1

Events					
WT 23/24	2250030	Thermodynamics III	2 SWS	Lecture /	Enders
WT 23/24	2250031	Thermodynamics III - Exercises	1 SWS	Practice /	Enders, und Mitarbeiter
Exams					
ST 2023	7200104	Thermodynamics III			Enders
WT 23/24	7200104	Thermodynamics III			Enders

Legend: Online, Blended (On-Site/Online), On-Site, × Cancelled

Competence Certificate
Learning control is a written examination lasting 90 minutes.

Prerequisites
None

T 5.100 Course: Tutorial Advanced Mathematics I [T-MATH-100525]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-CIWVT-106447 - Orientation Exam
M-MATH-100280 - Advanced Mathematics I

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each winter term	2

Events					
WT 23/24	0131100	Übungen zu 0131000	2 SWS	Practice	Hettlich
WT 23/24	0131300	Übungen zu 0131200	2 SWS	Practice	Hettlich
Exams					
WT 23/24	6700005	Problem Class for Advanced Mathematics I			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 5.101 Course: Tutorial Advanced Mathematics II [T-MATH-100526]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-100281 - Advanced Mathematics II

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each summer term	2

Events					
ST 2023	0180900	Übungen zu 0180800	2 SWS	Practice	Hettlich
ST 2023	0181100	Übungen zu 0181000	2 SWS	Practice	Hettlich
Exams					
ST 2023	7700024	Problem Class for Advanced Mathematics II			Hettlich, Arens, Griesmaier

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

T 5.102 Course: Tutorial Advanced Mathematics III [T-MATH-100527]

Responsible: PD Dr. Tilo Arens
Prof. Dr. Roland Griesmaier
PD Dr. Frank Hettlich

Organisation: KIT Department of Mathematics

Part of: M-MATH-100282 - Advanced Mathematics III

Type	Credits	Grading scale	Recurrence	Version
Completed coursework (written)	0	pass/fail	Each winter term	2

Events					
WT 23/24	0131500	Übungen zu 0131400	2 SWS	Practice	Arens
Exams					
WT 23/24	6700006	Tutorial Advanced Mathematics III			Arens, Griesmaier, Hettlich

Competence Certificate
Learning assessment is carried out by written assigments (pre-requesite). Exact requirements will be communicated in the lectures.

Prerequisites
None.

Karlsruher Institut für Technologie

Die Forschungsuniversität in der Helmholtz-Gemeinschaft

Amtliche Bekanntmachung

2023 **Ausgegeben Karlsruhe, den 28. April 2023** **Nr. 43**

I n h a l t **Seite**

Studien- und Prüfungsordnung des Karlsruher Instituts für Technologie (KIT) für den Bachelorstudiengang Bioingenieurwesen

vom 27. April 2023

Aufgrund von § 10 Absatz 2 Ziffer 4 und § 20 Absatz 2 KIT-Gesetz in der Fassung vom 14. Juli 2009 (GBl. S. 317 f), zuletzt geändert durch Artikel 2 des Gesetzes zur Änderung des Universitätsklinika-Gesetzes und anderer Gesetze vom 15. November 2022 (GBl. S. 585), und § 32 Absatz 3 Satz 1, 32 a Absatz 1 Satz Landeshochschulgesetz in der Fassung vom 1. Januar 2005 zuletzt geändert durch Artikel 8 des Gesetzes zum Erlass eines Klimaschutz- und Klimawandelanpassungsgesetz und zur Verankerung des Klimabelangs in weiteren Rechtsvorschriften vom 7. Februar 2023 (GBl. S. 26, 43), hat der KIT-Senat am 17. April 2023 die folgende Studien- und Prüfungsordnung für den Bachelorstudiengang Bioingenieurwesen beschlossen.

Der Präsident hat seine Zustimmung gemäß § 20 Absatz 2 KIT-Gesetz i.V.m. § 32 Absatz 3 Satz 1 Landeshochschulgesetz am 27. April 2023 erteilt.

Inhaltsverzeichnis

Präambel

Das KIT hat sich im Rahmen der Umsetzung des Bolognaprozesses zum Aufbau eines Europäischen Hochschulraumes zum Ziel gesetzt, dass am Abschluss des Studiums am KIT der Mastergrad stehen soll. Das KIT sieht daher die am KIT angebotenen konsekutiven Bachelor- und Masterstudiengänge als Gesamtkonzept mit konsekutivem Curriculum.

I. Allgemeine Bestimmungen

§ 1 Geltungsbereich

[1]Diese Bachelorprüfungsordnung regelt Studienablauf, Prüfungen und den Abschluss des Studiums im Bachelorstudiengang Bioingenieurwesen am KIT.

§ 2 Ziel des Studiums, akademischer Grad

(1) [1]Im Bachelorstudium sollen die wissenschaftlichen Grundlagen und die Methodenkompetenz der Fachwissenschaften vermittelt werden. [2]Ziel des Studiums ist die Fähigkeit, einen konsekutiven Masterstudiengang erfolgreich absolvieren zu können sowie das erworbene Wissen berufsfeldbezogen anwenden zu können.

(2) [1]Aufgrund der bestandenen Bachelorprüfung wird der akademische Grad „Bachelor of Science (B.Sc.)“ für den Bachelorstudiengang Bioingenieurwesen verliehen.

§ 3 Regelstudienzeit, Studienaufbau, Leistungspunkte

(1) [1]Der Studiengang nimmt teil am Programm „Studienmodelle individueller Geschwindigkeit“. [2]Die Studierenden haben im Rahmen der dortigen Kapazitäten und Regelungen bis einschließlich drittem Fachsemester Zugang zu den Veranstaltungen des MINT-Kollegs Baden-Württemberg (im folgenden MINT-Kolleg).

(2) [1]Die Regelstudienzeit beträgt sechs Semester. [2]Bei einer qualifizierten Teilnahme am MINT-Kolleg bleiben bei der Anrechnung auf die Regelstudienzeit bis zu zwei Semester unberücksichtigt. [3]Die konkrete Anzahl der Semester richtet sich nach § 8 Absatz 2 Satz 3 bis 5.

[4]Eine qualifizierte Teilnahme liegt vor, wenn der/die Studierende Veranstaltungen des MINT-Kollegs für die Dauer von mindestens einem Semester im Umfang von mindestens zwei Fachkursen (Gesamtworkload 10 Semesterwochenstunden) belegt hat. [5]Das MINT-Kolleg stellt hierüber eine Bescheinigung aus.

(3) [1]Das Lehrangebot des Studiengangs ist in Fächer, die Fächer sind in Module, die jeweiligen Module in Lehrveranstaltungen gegliedert. [2]Die Fächer und ihr Umfang werden in § 20 festgelegt. [3] Näheres beschreibt das Modulhandbuch.

(4) [1]Der für das Absolvieren von Lehrveranstaltungen und Modulen vorgesehene Arbeitsaufwand wird in Leistungspunkten (LP) ausgewiesen. [2]Die Maßstäbe für die Zuordnung von Leistungspunkten entsprechen dem European Credit Transfer System (ECTS). [3]Ein Leistungspunkt entspricht einem Arbeitsaufwand von etwa 30 Zeitstunden. [4]Die Verteilung der Leistungspunkte auf die Semester hat in der Regel gleichmäßig zu erfolgen.

(5) [1]Der Umfang der für den erfolgreichen Abschluss des Studiums erforderlichen Studien- und Prüfungsleistungen wird in Leistungspunkten gemessen und beträgt insgesamt 180 Leistungspunkte.

(6) [1]Lehrveranstaltungen können nach vorheriger Ankündigung auch in englischer Sprache angeboten werden, sofern es deutschsprachige Wahlmöglichkeiten gibt.

§ 4 Modulprüfungen, Studien- und Prüfungsleistungen

(1) [1]Die Bachelorprüfung besteht aus Modulprüfungen. [2]Modulprüfungen bestehen aus einer oder mehreren Erfolgskontrollen.

[3]Erfolgskontrollen gliedern sich in Studien- oder Prüfungsleistungen.

(2) [1]Prüfungsleistungen sind:

1. schriftliche Prüfungen,
2. mündliche Prüfungen oder
3. Prüfungsleistungen anderer Art.

(3) [1]Studienleistungen sind schriftliche, mündliche oder praktische Leistungen, die von den Studierenden in der Regel lehrveranstaltungsbegleitend erbracht werden.

(4) [1]Von den Modulprüfungen sollen mindestens 70 % benotet sein.

(5) [1]Bei sich ergänzenden Inhalten können die Modulprüfungen mehrerer Module durch eine auch modulübergreifende Prüfungsleistung (Absatz 2 Nummer 1 bis 3) ersetzt werden.

§ 5 Anmeldung und Zulassung zu den Modulprüfungen und Lehrveranstaltungen

(1) [1]Um an den Modulprüfungen teilnehmen zu können, müssen sich die Studierenden online im Studierendenportal zu den jeweiligen Erfolgskontrollen anmelden. [2]In Ausnahmefällen kann eine Anmeldung schriftlich beim Bachelorprüfungsausschuss erfolgen. [3]Für die Erfolgskontrollen können durch die Prüfenden Anmeldefristen festgelegt werden. [4]Die Anmeldung der Bachelorarbeit erfolgt über den Bachelorprüfungsausschuss im Studierendenportal, Näheres ist im Modulhandbuch geregelt.

(2) [1]Sofern Wahlmöglichkeiten bestehen, müssen Studierende, um zu einer Prüfung in einem bestimmten Modul zugelassen zu werden, vor der ersten Prüfung in diesem Modul mit der Anmeldung zu der Prüfung eine bindende Erklärung über die Wahl des betreffenden Moduls und dessen Zuordnung zu einem Fach abgeben. [2]Wegen eines von dem/der Studierenden nicht zu vertretenden Umstandes kann auf Antrag des/der Studierenden an den Prüfungsausschuss die Wahl oder die Zuordnung nachträglich geändert werden. [3]Ein einmal begonnenes Prüfungsverfahren ist zu beenden, das heißt eine erstmals nicht bestandene Prüfung ist zu wiederholen.

(3) [1]Zu einer Erfolgskontrolle ist zuzulassen, wer

1. in den Bachelorstudiengang Bioingenieurwesen am KIT eingeschrieben ist; die Zulassung beurlaubter Studierender ist auf Prüfungsleistungen im Sinne des § 14 Absatz 7 Satz 1 der Zulassungs- und Immatrikulationsordnung des KIT beschränkt; und
2. nachweist, dass er/sie die im Modulhandbuch für die Zulassung zu einer Erfolgskontrolle festgelegten Voraussetzungen erfüllt, und
3. nachweist, dass er/sie in dem Bachelorstudiengang Bioingenieurwesen den Prüfungsanspruch nicht verloren hat.

(4) [1]Nach Maßgabe von § 30 Absatz 5 Landeshochschulgesetz kann die Zulassung zu einzelnen Pflichtveranstaltungen beschränkt werden. [2]Der/die Prüfende entscheidet über die Auswahl unter den Studierenden, die sich rechtzeitig bis zu dem von dem/der Prüfenden festgesetzten Termin angemeldet haben unter Berücksichtigung des Studienfortschritts dieser Studierenden und unter Beachtung von § 4 Absatz 1 Satz 1 und 2 der Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung, sofern ein Abbau des Überhangs durch andere oder zusätzliche Veranstaltungen nicht möglich ist. [3]Für den Fall gleichen Studienfortschritts sind durch die

KIT-Fakultäten weitere Kriterien festzulegen. [4]Das Ergebnis wird den Studierenden rechtzeitig bekannt gegeben.

(5) [1]Die Zulassung ist abzulehnen, wenn die in Absatz 3 und 4 genannten Voraussetzungen nicht erfüllt sind.

§ 6 Durchführung von Erfolgskontrollen

(1) [1]Erfolgskontrollen werden studienbegleitend, in der Regel im Verlauf der Vermittlung der Lehrinhalte der einzelnen Module oder zeitnah danach, durchgeführt.

(2) [1]Die Art der Erfolgskontrolle (§ 4 Absatz 2 Nummer 1 bis 3, Absatz 3) wird von der/dem Prüfenden der betreffenden Lehrveranstaltung in Bezug auf die Lerninhalte der Lehrveranstaltung und die Lernziele des Moduls festgelegt. [2]Die Art der Erfolgskontrolle, ihre Häufigkeit, Reihenfolge und Gewichtung sowie gegebenenfalls die Bildung der Modulnote müssen mindestens sechs Wochen vor Vorlesungsbeginn im Modulhandbuch bekannt gemacht werden. [3]Im Einvernehmen von Prüfender bzw. Prüfendem und Studierender bzw. Studierendem und mit Zustimmung des Prüfungsausschusses für den Bachelorstudiengang Bioingenieurwesen können die Art der Prüfungsleistung sowie die Prüfungssprache auch nachträglich geändert werden; im ersten Fall ist jedoch § 4 Absatz 5 zu berücksichtigen. [4]Bei der Prüfungsorganisation sind die Belange Studierender mit in besonderen Lebenslagen gemäß § 4 Absatz 1 der Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung zu berücksichtigen. [5]§ 2 und § 4 Absatz 1 Satz 3 der Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung gelten entsprechend.

(3) [1]Bei unvertretbar hohem Prüfungsaufwand kann eine schriftlich durchzuführende Prüfungsleistung auch mündlich, oder eine mündlich durchzuführende Prüfungsleistung auch schriftlich abgenommen werden. [2]Diese Änderung muss mindestens sechs Wochen vor der Prüfungsleistung bekannt gegeben werden.

(4) [1]Bei Lehrveranstaltungen in englischer Sprache (§ 3 Absatz 6) können die entsprechenden Erfolgskontrollen in dieser Sprache abgenommen werden. [2]§ 6 Absatz 2 gilt entsprechend.

(5) [1]*Schriftliche Prüfungen* (§ 4 Absatz 2 Nummer 1) sind in der Regel von einer/einem Prüfenden nach § 18 Absatz 2 oder 3 zu bewerten. [2]Sofern eine Bewertung durch mehrere Prüfende erfolgt, ergibt sich die Note aus dem arithmetischen Mittel der Einzelbewertungen. [3]Entspricht das arithmetische Mittel keiner der in § 7 Absatz 2 Satz 2 definierten Notenstufen, so ist auf die nächstliegende Notenstufe auf- oder abzurunden. [4]Bei gleichem Abstand ist auf die nächstbessere Notenstufe zu runden. [5]Das Bewertungsverfahren soll sechs Wochen nicht überschreiten. [6]Schriftliche Prüfungen dauern mindestens 60 und höchstens 300 Minuten.

(6) [1]*Mündliche Prüfungen* (§ 4 Absatz 2 Nummer 2) sind von mehreren Prüfenden (Kollegialprüfung) oder von einer/einem Prüfenden in Gegenwart einer oder eines Beisitzenden als Gruppen- oder Einzelprüfungen abzunehmen und zu bewerten. [2]Vor der Festsetzung der Note hört die/der Prüfende die anderen an der Kollegialprüfung mitwirkenden Prüfenden an. [3]Mündliche Prüfungen dauern in der Regel mindestens 15 Minuten und maximal 60 Minuten pro Studierenden.

[4]Die wesentlichen Gegenstände und Ergebnisse der *mündlichen Prüfung* sind in einem Protokoll festzuhalten. [5]Das Ergebnis der Prüfung ist den Studierenden im Anschluss an die mündliche Prüfung bekannt zu geben.

[6]Studierende, die sich in einem späteren Semester der gleichen Prüfung unterziehen wollen, werden entsprechend den räumlichen Verhältnissen und nach Zustimmung des Prüflings als Zuhörerinnen und Zuhörer bei mündlichen Prüfungen zugelassen. [7]Die Zulassung erstreckt sich nicht auf die Beratung und Bekanntgabe der Prüfungsergebnisse.

(7) [1]Für *Prüfungsleistungen anderer Art* (§ 4 Absatz 2 Nummer 3) sind angemessene Bearbeitungsfristen einzuräumen und Abgabetermine festzulegen. [2]Dabei ist durch die Art der Aufgabenstellung und durch entsprechende Dokumentation sicherzustellen, dass die erbrachte Prü-

fungsleistung dem/der Studierenden zurechenbar ist. [3]Die wesentlichen Gegenstände und Ergebnisse einer solchen Erfolgskontrolle sind in einem Protokoll festzuhalten.

[4]Bei *mündlich* durchgeführten *Prüfungsleistungen anderer Art* muss neben der/dem Prüfenden ein/e Beisitzende/r anwesend sein, die/der zusätzlich zum/zur Prüfenden das Protokoll zeichnet.

[5]*Schriftliche Arbeiten* im Rahmen einer *Prüfungsleistung anderer Art* haben dabei die folgende Erklärung zu tragen: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig angefertigt, alle benutzten Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde.“ [6]Trägt die Arbeit diese Erklärung nicht, wird sie nicht angenommen. [7]Die wesentlichen Gegenstände und Ergebnisse der Erfolgskontrolle sind in einem Protokoll festzuhalten.

§ 6 a Erfolgskontrollen im Antwort-Wahl-Verfahren

[1]Für die Durchführung von Erfolgskontrollen im Antwort-Wahl-Verfahren findet die Satzung des Karlsruher Instituts für Technologie (KIT) zur Durchführung von Erfolgskontrollen im Antwort-Wahl-Verfahren in der jeweils gültigen Fassung Anwendung.

§ 6 b Online-Prüfungen

[1]Für die Durchführung von Online-Prüfungen findet die Satzung zur Durchführung von Online-Prüfungen am Karlsruher Institut für Technologie (KIT) in der jeweils gültigen Fassung Anwendung.

§ 7 Bewertung von Studien- und Prüfungsleistungen

(1) [1]Das Ergebnis einer Prüfungsleistung wird von den jeweiligen Prüfenden in Form einer Note festgesetzt.

(2) [1]Folgende Noten sollen verwendet werden:

sehr gut (very good)	:	hervorragende Leistung,
gut (good)	:	eine Leistung, die erheblich über den durchschnittlichen Anforderungen liegt,
befriedigend (satisfactory)	:	eine Leistung, die durchschnittlichen Anforderungen entspricht,
ausreichend (sufficient)	:	eine Leistung, die trotz ihrer Mängel noch den Anforderungen genügt,
nicht ausreichend (failed)	:	eine Leistung, die wegen erheblicher Mängel nicht den Anforderungen genügt.

[2]Zur differenzierten Bewertung einzelner Prüfungsleistungen sind nur folgende Noten zugelassen:

1,0; 1,3	:	sehr gut
1,7; 2,0; 2,3	:	gut
2,7; 3,0; 3,3	:	befriedigend
3,7; 4,0	:	ausreichend
5,0	:	nicht ausreichend.

(3) [1]Studienleistungen werden mit „bestanden“ oder mit „nicht bestanden“ gewertet.

(4) [1]Bei der Bildung der gewichteten Durchschnitte der Modulnoten, der Fachnoten und der Gesamtnote wird nur die erste Dezimalstelle hinter dem Komma berücksichtigt; alle weiteren Stellen werden ohne Rundung gestrichen.

(5) [1]Jedes Modul und jede Erfolgskontrolle darf in demselben Studiengang nur einmal gewertet werden.

(6) [1]Eine Prüfungsleistung ist bestanden, wenn die Note mindestens „ausreichend“ (4,0) ist.

(7) [1]Die Modulprüfung ist bestanden, wenn alle erforderlichen Erfolgskontrollen bestanden sind. [2]Die Modulprüfung und die Bildung der Modulnote sollen im Modulhandbuch geregelt werden. [3]Sofern das Modulhandbuch keine Regelung über die Bildung der Modulnote enthält, errechnet sich die Modulnote aus einem nach den Leistungspunkten der einzelnen Teilmodule gewichteten Notendurchschnitt. [4]Die differenzierten Noten (Absatz 2) sind bei der Berechnung der Modulnoten als Ausgangsdaten zu verwenden.

(8) [1]Die Ergebnisse der Erfolgskontrollen sowie die erworbenen Leistungspunkte werden durch den Studierendenservice des KIT verwaltet.

(9) [1]Die Noten der Module eines Faches gehen in die Fachnote mit einem Gewicht proportional zu den ausgewiesenen Leistungspunkten der Module ein.

(10) [1]Die Gesamtnote der Bachelorprüfung, die Fachnoten und die Modulnoten lauten:

		bis	1,5	=	sehr gut
von	1,6	bis	2,5	=	gut
von	2,6	bis	3,5	=	befriedigend
von	3,6	bis	4,0	=	ausreichend.

§ 8 Orientierungsprüfungen, Verlust des Prüfungsanspruchs

(1) [1]Die Modulprüfung in den Modulen „Höhere Mathematik I“ sowie die Teilmodulprüfungen „Zellbiologie“ und „Genetik“ im Modul Biologie im Ingenieurwesen sind bis zum Ende des zweiten Fachsemesters abzulegen (Orientierungsprüfungen).

(2) [1]Wer die Orientierungsprüfungen einschließlich etwaiger Wiederholungen bis zum Ende des dritten Fachsemesters nicht erfolgreich abgelegt hat, verliert den Prüfungsanspruch im Studiengang Bioingenieurwesen, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist; hierüber entscheidet der Prüfungsausschuss auf Antrag der oder des Studierenden. [2]Eine zweite Wiederholung der Orientierungsprüfungen ist ausgeschlossen.

[3]Die Fristüberschreitung hat die/der Studierende insbesondere dann nicht zu vertreten, wenn eine qualifizierte Teilnahme am MINT-Kolleg im Sinne von § 3 Absatz 2 vorliegt. [4]Ohne ausdrückliche Genehmigung der/des Vorsitzenden des Prüfungsausschusses gilt eine Fristüberschreitung von

1. einem Semester als genehmigt, wenn die/der Studierende eine qualifizierte Teilnahme am MINT-Kolleg gemäß § 3 Absatz 2 im Umfang von einem Semester nachweist oder
2. zwei Semestern als genehmigt, wenn die/der Studierende eine qualifizierte Teilnahme am MINT-Kolleg gemäß § 3 Absatz 2 im Umfang von zwei Semestern nachweist.

[5]Als Nachweis gilt die vom MINT-Kolleg gemäß § 3 Absatz 2 auszustellende Bescheinigung, die beim Studierendenservice des KIT einzureichen ist. [6]Im Falle von Nummer 1 kann die/der Vorsitzende des Prüfungsausschusses auf Antrag der Studierenden die Frist um ein weiteres Semester verlängern, wenn dies aus studienorganisatorischen Gründen für das fristgerechte Ablegen der Orientierungsprüfung erforderlich ist, insbesondere weil die Module, die Bestandteil der Orientierungsprüfung sind, nur einmal jährlich angeboten werden.

(3) [1]Ist die Bachelorprüfung bis zum Ende des 12. Fachsemesters einschließlich etwaiger Wiederholungen nicht vollständig abgelegt, so erlischt der Prüfungsanspruch im Bachelorstudien-

gang Bioingenieurwesen, es sei denn, dass die Fristüberschreitung nicht selbst zu vertreten ist. [2]Die Entscheidung über eine Fristverlängerung und über Ausnahmen von der Fristregelung trifft der Prüfungsausschuss unter Beachtung der in § 32 Absatz 6 Landeshochschulgesetz genannten Tätigkeiten auf Antrag des/der Studierenden. [3]Der Antrag ist schriftlich in der Regel bis sechs Wochen vor Ablauf der in Satz 1 genannten Studienhöchstdauer zu stellen. [4]Absatz 2 Satz 3 bis 5 gelten entsprechend

(4) [1]Der Prüfungsanspruch geht auch verloren, wenn eine nach dieser Studien- und Prüfungsordnung erforderliche Studien- oder Prüfungsleistung endgültig nicht bestanden ist.

§ 9 Wiederholung von Erfolgskontrollen, endgültiges Nichtbestehen

(1) [1]Studierende können eine nicht bestandene schriftliche Prüfung (§ 4 Absatz 2 Nummer 1) einmal wiederholen. [2]Wird eine schriftliche Wiederholungsprüfung mit „nicht ausreichend“ (5,0) bewertet, so erfolgt in zeitlichem Zusammenhang eine mündliche Fortsetzung der Wiederholungsprüfung (mündliche Nachprüfung). [2]Die Note der Wiederholungsprüfung, die in diesem Fall nur „ausreichend“ (4,0) oder „nicht ausreichend“ (5,0) lauten kann, wird von den Prüfenden bzw. der/dem Prüfenden unter angemessener Berücksichtigung der schriftlichen Leistung und des Ergebnisses der mündlichen Nachprüfung festgesetzt. [3]Mündliche Nachprüfungen dauern in der Regel mindestens 15 Minuten und maximal 30 Minuten. [4]§ 6 Absatz 6 Satz 1 und 2 sowie Satz 4 und 5 gelten entsprechend. [5]Sofern gemäß § 11 eine schriftliche Wiederholungsprüfung als mit „nicht ausreichend“ (5,0) bewertet gilt, ist eine mündliche Nachprüfung ausgeschlossen.

(2) [1]Studierende können eine nicht bestandene mündliche Prüfung (§ 4 Absatz 2 Nummer 2) einmal wiederholen.

(3) [1]Wiederholungsprüfungen nach Absatz 1 und 2 müssen in Inhalt, Umfang und Form (mündlich oder schriftlich) der ersten entsprechen. [2]Ausnahmen kann der zuständige Prüfungsausschuss auf Antrag zulassen.

(4) [1]Prüfungsleistungen anderer Art (§ 4 Absatz 2 Nummer 3) können einmal wiederholt werden.

(5) [1]Studienleistungen können mehrfach wiederholt werden.

(6) [1]Die Prüfungsleistung ist endgültig nicht bestanden, wenn die mündliche Nachprüfung im Sinne des Absatzes 1 mit „nicht ausreichend“ (5,0) bewertet wurde. [2]Die Prüfungsleistung ist ferner endgültig nicht bestanden, wenn die mündliche Prüfung im Sinne des Absatzes 2 oder die Prüfungsleistung anderer Art gemäß Absatz 4 zweimal mit „nicht bestanden“ bewertet wurde.

(7) [1]Das Modul ist endgültig nicht bestanden, wenn eine für sein Bestehen erforderliche Prüfungsleistung endgültig nicht bestanden ist.

(8) [1]Eine zweite Wiederholung derselben Prüfungsleistung gemäß § 4 Absatz 2 ist nur in Ausnahmefällen auf Antrag des/der Studierenden zulässig („Antrag auf Zweitwiederholung“). [2]Der Antrag ist schriftlich beim Prüfungsausschuss in der Regel bis zwei Monate nach Bekanntgabe der Note zu stellen.

[3]Über den ersten Antrag eines/einer Studierenden auf Zweitwiederholung entscheidet der Prüfungsausschuss, wenn er den Antrag genehmigt. [4]Wenn der Prüfungsausschuss diesen Antrag ablehnt, entscheidet ein Mitglied des Präsidiums. [5]Über weitere Anträge auf Zweitwiederholung entscheidet nach Stellungnahme des Prüfungsausschusses ein Mitglied des Präsidiums. [6]Wird der Antrag genehmigt, hat die Zweitwiederholung spätestens zum übernächsten Prüfungstermin zu erfolgen. [7]Absatz 1 Satz 2 und 3 gelten entsprechend.

(9) [1]Die Wiederholung einer bestandenen Prüfungsleistung ist nicht zulässig.

(10) [1]Die Bachelorarbeit kann bei einer Bewertung mit „nicht ausreichend“ (5,0) einmal wiederholt werden. [2]Eine zweite Wiederholung der Bachelorarbeit ist ausgeschlossen.

§ 10 Abmeldung; Versäumnis, Rücktritt

(1) [1]Studierende können ihre Anmeldung zu *schriftlichen Prüfungen* ohne Angabe von Gründen bis zur Ausgabe der Prüfungsaufgaben widerrufen (Abmeldung). [2]Eine Abmeldung kann online im Studierendenportal bis 24:00 Uhr des Vortages der Prüfung oder in begründeten Ausnahmefällen beim Bachelorprüfungsausschuss erfolgen. [3]Erfolgt die Abmeldung gegenüber dem/der Prüfenden hat diese/r Sorge zu tragen, dass die Abmeldung im Campus Management System verbucht wird.

(2) [1]Bei *mündlichen Prüfungen* muss die Abmeldung spätestens drei Werktage vor dem betreffenden Prüfungstermin gegenüber dem/der Prüfenden erklärt werden. [2]Der Rücktritt von einer mündlichen Prüfung weniger als drei Werktage vor dem betreffenden Prüfungstermin ist nur unter den Voraussetzungen des Absatzes 5 möglich. [3]Der Rücktritt von mündlichen Nachprüfungen im Sinne von § 9 Absatz 1 ist grundsätzlich nur unter den Voraussetzungen von Absatz 5 möglich.

(3) [1]Die Abmeldung von *Prüfungsleistungen anderer Art* sowie von *Studienleistungen* ist im Modulhandbuch geregelt.

(4) [1]Eine Erfolgskontrolle gilt als mit „nicht ausreichend“ (5,0) bewertet, wenn Studierende einen Prüfungstermin ohne triftigen Grund versäumen oder wenn sie nach Beginn der Erfolgskontrolle ohne triftigen Grund von dieser zurücktreten. [2]Dasselbe gilt, wenn die Bachelorarbeit nicht innerhalb der vorgesehenen Bearbeitungszeit erbracht wird, es sei denn, der/die Studierende hat die Fristüberschreitung nicht zu vertreten.

(5) [1]Der für den Rücktritt nach Beginn der Erfolgskontrolle oder das Versäumnis geltend gemachte Grund muss dem Prüfungsausschuss unverzüglich schriftlich angezeigt und glaubhaft gemacht werden. [2]Bei Krankheit des/der Studierenden oder eines allein zu versorgenden Kindes oder pflegebedürftigen Angehörigen kann die Vorlage eines ärztlichen Attestes verlangt werden.

§ 11 Täuschung, Ordnungsverstoß

(1) [1]Versuchen Studierende das Ergebnis ihrer Erfolgskontrolle durch Täuschung oder Benutzung nicht zugelassener Hilfsmittel zu beeinflussen, gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend“ (5,0) bewertet.

(2) [1]Studierende, die den ordnungsgemäßen Ablauf einer Erfolgskontrolle stören, können von der/dem Prüfenden oder der Aufsicht führenden Person von der Fortsetzung der Erfolgskontrolle ausgeschlossen werden. [2]In diesem Fall gilt die betreffende Erfolgskontrolle als mit „nicht ausreichend“ (5,0) bewertet. [3]In schwerwiegenden Fällen kann der Prüfungsausschuss diese Studierenden von der Erbringung weiterer Erfolgskontrollen ausschließen.

(3) [1]Näheres regelt die Allgemeine Satzung des KIT zur Redlichkeit bei Prüfungen und Praktika in der jeweils gültigen Fassung.

§ 12 Mutterschutz, Elternzeit, Wahrnehmung von Familienpflichten

[1]Für den Ausgleich von Nachteilen bei Studierenden in besonderen Lebenslagen findet die Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung Anwendung.

§ 13 Studierende mit Behinderung oder chronischer Erkrankung

[1]Für den Ausgleich von Nachteilen bei Studierenden in besonderen Lebenslagen findet die Satzung über nachteilsausgleichende Regelungen in den Bachelor- und Masterstudiengängen am Karlsruher Institut für Technologie (KIT) in der jeweils geltenden Fassung Anwendung.

§ 14 Modul Bachelorarbeit

(1) [1]Voraussetzung für die Zulassung zum Modul Bachelorarbeit ist, dass die/der Studierende Modulprüfungen im Umfang von 120 LP erfolgreich abgelegt hat. [2]Über Ausnahmen entscheidet der Prüfungsausschuss auf Antrag der/des Studierenden.

(1 a) [1]Dem Modul Bachelorarbeit sind 12 LP zugeordnet. [2]Es besteht aus der Bachelorarbeit und einer Präsentation. [3]Die Präsentation soll spätestens vier Wochen nach Abgabe der Arbeit stattfinden.

(2) [1]Die Bachelorarbeit kann von Hochschullehrerinnen und Hochschullehrern am KIT sowie habilitierten Mitgliedern der KIT-Fakultät Chemieingenieurwesen und Verfahrenstechnik vergeben werden. [2]Darüber hinaus kann der Prüfungsausschuss weitere Prüfende gemäß § 18 Absatz 2 und 3 zur Vergabe des Themas berechtigen. [3]Den Studierenden ist Gelegenheit zu geben, für das Thema Vorschläge zu machen. [4]Soll die Bachelorarbeit außerhalb der KIT-Fakultät für Chemieingenieurwesen und Verfahrenstechnik angefertigt werden, so bedarf dies der Genehmigung durch den Prüfungsausschuss. [5]Die Bachelorarbeit kann auch in Form einer Gruppenarbeit zugelassen werden, wenn der als Prüfungsleistung zu bewertende Beitrag der/des einzelnen Studierenden aufgrund objektiver Kriterien, die eine eindeutige Abgrenzung ermöglichen, deutlich unterscheidbar ist und die Anforderung nach Absatz 4 erfüllt. [6]In Ausnahmefällen sorgt die/der Vorsitzende des Prüfungsausschusses auf Antrag der oder des Studierenden dafür, dass die/der Studierende innerhalb von vier Wochen ein Thema für die Bachelorarbeit erhält. [7]Die Ausgabe des Themas erfolgt in diesem Fall über die/den Vorsitzende/n des Prüfungsausschusses.

(3) [1]Thema, Aufgabenstellung und Umfang der Bachelorarbeit sind von dem Betreuer bzw. der Betreuerin so zu begrenzen, dass sie mit dem in Absatz 4 festgelegten Arbeitsaufwand bearbeitet werden kann.

(4) [1]Die Bachelorarbeit soll zeigen, dass die Studierenden in der Lage sind, ein Problem aus ihrem Studienfach selbstständig und in begrenzter Zeit nach wissenschaftlichen Methoden zu bearbeiten. [2]Der Umfang der Bachelorarbeit entspricht 12 Leistungspunkten. [3]Die maximale Bearbeitungsdauer beträgt vier Monate. [4]Thema und Aufgabenstellung sind an den vorgesehenen Umfang anzupassen. [5]Der Prüfungsausschuss legt fest, in welchen Sprachen die Bachelorarbeit geschrieben werden kann. [6]Auf Antrag des Studierenden kann der/die Prüfende genehmigen, dass die Bachelorarbeit in einer anderen Sprache als Deutsch geschrieben wird.

(5) [1]Bei der Abgabe der Bachelorarbeit haben die Studierenden zu versichern, dass sie die Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt haben, die wörtlich oder inhaltlich übernommenen Stellen als solche kenntlich gemacht und die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet haben. [2]Wenn diese Erklärung nicht enthalten ist, wird die Arbeit nicht angenommen. [3]Die Erklärung kann wie folgt lauten: „Ich versichere wahrheitsgemäß, die Arbeit selbstständig verfasst, alle benutzten Quellen und Hilfsmittel vollständig und genau angegeben und alles kenntlich gemacht zu haben, was aus Arbeiten anderer unverändert oder mit Abänderungen entnommen wurde sowie die Satzung des KIT zur Sicherung guter wissenschaftlicher Praxis in der jeweils gültigen Fassung beachtet zu haben.“ [4]Bei Abgabe einer unwahren Versicherung wird die Bachelorarbeit mit „nicht ausreichend“ (5,0) bewertet.

(6) [1]Der Zeitpunkt der Ausgabe des Themas der Bachelorarbeit ist durch die Betreuerin/den Betreuer und die/den Studierenden festzuhalten und dies beim Prüfungsausschuss aktenkundig zu machen. [2]Die Abgabe der Bachelorarbeit erfolgt beim Prüfungsausschuss in sicherer, dem Stand der Technik entsprechender digitaler Form. [3]Die Einzelheiten, insbesondere die zulässigen digitale Abgabeformen, regelt das Modulhandbuch. [4]Der Zeitpunkt der Abgabe der Bachelorarbeit ist durch den Prüfungsausschuss aktenkundig zu machen. [5]Nach Maßgabe der/des Prüfenden ist zusätzlich ein gedrucktes Exemplar der Bachelorarbeit bei diesem abzugeben. [6]In diesem Fall muss der/die Studierende versichern, dass das in digitaler Form eingereichte Exemplar sowie das gedruckte Exemplar übereinstimmen. [7]Das Thema kann nur einmal und nur innerhalb des ersten Monats der Bearbeitungszeit zurückgegeben werden. [8]Macht der oder die Studierende einen triftigen Grund geltend, kann der Prüfungsausschuss die in Absatz 4 festge-

legte Bearbeitungszeit auf Antrag der oder des Studierenden um höchstens einen Monat verlängern. [9]Wird die Bachelorarbeit nicht fristgerecht abgeliefert, gilt sie als mit „nicht ausreichend“ (5,0) bewertet, es sei denn, dass die Studierenden dieses Versäumnis nicht zu vertreten haben.

(7) [1]Die Bachelorarbeit wird von mindestens einer Hochschullehrerin bzw. einem Hochschullehrer am KIT oder einem habilitierten Mitglied der KIT-Fakultät für Chemieingenieurwesen und Verfahrenstechnik und einem/einer weiteren Prüfenden bewertet. [2]In der Regel ist eine/r der Prüfenden die Person, die die Arbeit gemäß Absatz 2 vergeben hat. [3]Bei nicht übereinstimmender Beurteilung dieser beiden Personen setzt der Prüfungsausschuss im Rahmen der Bewertung dieser beiden Personen die Note der Bachelorarbeit fest; er kann auch eine/n weitere/n Gutachter/in bestellen. [4]Die Bewertung hat innerhalb von sechs Wochen nach Abgabe der Bachelorarbeit zu erfolgen.

§ 15 Zusatzleistungen

(1) [1]Es können auch weitere Leistungspunkte (Zusatzleistungen) im Umfang von höchstens 30 LP aus dem Gesamtangebot des KIT erworben werden. [2]§ 3 und § 4 der Prüfungsordnung bleiben davon unberührt. [3]Diese Zusatzleistungen gehen nicht in die Festsetzung der Gesamt- und Modulnoten ein. [4]Die bei der Festlegung der Modulnote nicht berücksichtigten LP werden als Zusatzleistungen im Transcript of Records aufgeführt und als Zusatzleistungen gekennzeichnet. [5]Auf Antrag der/des Studierenden werden die Zusatzleistungen in das Bachelorzeugnis aufgenommen und als Zusatzleistungen gekennzeichnet. [6]Zusatzleistungen werden mit den nach § 7 vorgesehenen Noten gelistet.

(2) [1]Die Studierenden haben bereits bei der Anmeldung zu einer Prüfung in einem Modul diese als Zusatzleistung zu deklarieren.

§ 15 a Mastervorzug

[1]Studierende, die im Bachelorstudium bereits mindestens 120 LP erworben haben, können zusätzlich zu den in § 15 Absatz 1 genannten Zusatzleistungen Leistungspunkte aus einem konsekutiven Masterstudiengang am KIT im Umfang von höchstens 30 LP erwerben (Mastervorzugsleistungen). [2]§ 3 und § 4 der Prüfungsordnung bleiben davon unberührt. [3]Die Mastervorzugsleistungen gehen nicht in die Festsetzung der Gesamt-, Fach- und Modulnoten ein. [4]Sie werden im Transcript of Records aufgeführt und als solche gekennzeichnet sowie mit den nach § 7 vorgesehenen Noten gelistet. [5]§ 15 Absatz 2 gilt entsprechend.

§ 16 Überfachliche Qualifikationen

[1]Neben der Vermittlung von fachlichen Qualifikationen ist der Auf- und Ausbau überfachlicher Qualifikationen im Umfang von mindestens 6 LP Bestandteil eines Bachelorstudiums. [2]Überfachliche Qualifikationen können additiv oder integrativ vermittelt werden.

§ 17 Prüfungsausschuss

(1) [1]Für den Bachelorstudiengang Bioingenieurwesen wird ein Prüfungsausschuss gebildet. [2]Er besteht aus vier stimmberechtigten Mitgliedern: davon mindestens zwei Hochschullehrerinnen bzw. Hochschullehrer am KIT/Privatdozentinnen bzw. -dozenten und höchstens zwei akademischen Mitarbeiterinnen bzw. Mitarbeitern am KIT und einer bzw. einem Studierenden mit beratender Stimme. [3]Im Falle der Einrichtung eines gemeinsamen Prüfungsausschusses für den Bachelor- und den Masterstudiengang Bioingenieurwesen erhöht sich die Anzahl der Studierenden auf zwei Mitglieder mit beratender Stimme, wobei je eine bzw. einer dieser Beiden aus dem Bachelor- und aus dem Masterstudiengang stammt. [4]Die Amtszeit der nichtstudentischen Mitglieder beträgt zwei Jahre, die des studentischen Mitglieds ein Jahr.

(2) [1]Die/der Vorsitzende, ihre/sein Stellvertreter/in, die weiteren Mitglieder des Prüfungsausschusses sowie deren Stellvertreter/innen werden von dem KIT-Fakultätsrat bestellt, die akade-

mischen Mitarbeiterinnen und Mitarbeiter am KIT und die Studierenden auf Vorschlag der Mitglieder der jeweiligen Gruppe; Wiederbestellung ist möglich. [2]Die/der Vorsitzende und deren/dessen Stellvertreter/in müssen Hochschullehrerinnen bzw. Hochschullehrer am KIT sein. [3]Die/der Vorsitzende des Prüfungsausschusses nimmt die laufenden Geschäfte wahr und wird durch das jeweilige Prüfungssekretariat unterstützt.

(3) [1]Der Prüfungsausschuss achtet auf die Einhaltung der Bestimmungen dieser Studien- und Prüfungsordnung und fällt die Entscheidungen in Prüfungsangelegenheiten. [2]Er entscheidet über die Anerkennung von Studienzeiten sowie Studien- und Prüfungsleistungen und trifft die Feststellung gemäß § 19 Absatz 1 Satz 1. [3]Er berichtet der KIT-Fakultät regelmäßig über die Entwicklung der Prüfungs- und Studienzeiten, einschließlich der Bearbeitungszeiten für die Bachelorarbeiten und die Verteilung der Modul- und Gesamtnoten. [4]Er ist zuständig für Anregungen zur Reform der Studien- und Prüfungsordnung und zu Modulbeschreibungen. [5]Der Prüfungsausschuss entscheidet mit der Mehrheit seiner Stimmen. [6]Bei Stimmengleichheit entscheidet die/der Vorsitzende des Prüfungsausschusses.

(4) [1]Der Prüfungsausschuss kann die Erledigung seiner Aufgaben für alle Regelfälle auf die/den Vorsitzende/n des Prüfungsausschusses übertragen. [2]In dringenden Angelegenheiten, deren Erledigung nicht bis zu der nächsten Sitzung des Prüfungsausschusses warten kann, entscheidet die/der Vorsitzende des Prüfungsausschusses.

(5) [1]Die Mitglieder des Prüfungsausschusses haben das Recht, der Abnahme von Prüfungen beizuwohnen. [2]Die Mitglieder des Prüfungsausschusses, die Prüfenden und die Beisitzenden unterliegen der Verschwiegenheit. [3]Sofern sie nicht im öffentlichen Dienst stehen, sind sie durch die/den Vorsitzende/n zur Verschwiegenheit zu verpflichten.

(6) [1]In Angelegenheiten des Prüfungsausschusses, die eine an einer anderen KIT-Fakultät zu absolvierende Prüfungsleistung betreffen, ist auf Antrag eines Mitgliedes des Prüfungsausschusses eine fachlich zuständige und von der betroffenen KIT-Fakultät zu nennende prüfungsberechtigte Person hinzuzuziehen.

(7) [1]Belastende Entscheidungen des Prüfungsausschusses sind schriftlich mitzuteilen. [2]Sie sind zu begründen und mit einer Rechtsbehelfsbelehrung zu versehen. [3]Vor einer Entscheidung ist Gelegenheit zur Äußerung zu geben. [4]Widersprüche gegen Entscheidungen des Prüfungsausschusses sind innerhalb eines Monats nach Zugang der Entscheidung bei diesem einzulegen. [5]Über Widersprüche entscheidet das für Lehre zuständige Mitglied des Präsidiums.

§ 18 Prüfende und Beisitzende

(1) [1]Der Prüfungsausschuss bestellt die Prüfenden. [2]Er kann die Bestellung der/dem Vorsitzenden übertragen.

(2) [1]Prüfende sind Hochschullehrinnen und Hochschullehrer am KIT, habilitierte Mitglieder und akademische Mitarbeiterinnen und Mitarbeiter am KIT, welche der KIT-Fakultät angehören und denen die Prüfungsbefugnis gemäß § 14 Absatz 2, § 14 b Absatz 1 Nummer 1 i.V.m. [2]§ 52 Absatz 1 Satz 6 Halbsatz 2 Landeshochschulgesetz übertragen wurde. [3]Bestellt werden darf nur, wer mindestens die dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat.

(3) [1]Soweit Lehrveranstaltungen von anderen als den unter Absatz 2 genannten Personen durchgeführt werden, sollen diese zu Prüfenden bestellt werden, sofern sie die gemäß Absatz 2 Satz 2 vorausgesetzte Qualifikation nachweisen können.

(4) [1]Die Beisitzenden werden durch die Prüfenden benannt. [2]Zu Beisitzenden darf nur benannt werden, wer eine dem jeweiligen Prüfungsgegenstand entsprechende fachwissenschaftliche Qualifikation erworben hat.

§ 19 Anerkennung von Studien- und Prüfungsleistungen, Studienzeiten

(1) [1]Studien- und Prüfungsleistungen sowie Studienzeiten, die in Studiengängen an staatlichen oder staatlich anerkannten Hochschulen und Berufsakademien der Bundesrepublik Deutschland oder an ausländischen staatlichen oder staatlich anerkannten Hochschulen erbracht wurden, werden auf Antrag der Studierenden anerkannt, sofern hinsichtlich der erworbenen Kompetenzen kein wesentlicher Unterschied zu den Leistungen oder Abschlüssen besteht, die ersetzt werden sollen. [2]Dabei ist kein schematischer Vergleich, sondern eine Gesamtbetrachtung vorzunehmen. [3]Bezüglich des Umfangs einer zur Anerkennung vorgelegten Studien- und Prüfungsleistung (Anrechnung) werden die Grundsätze des ECTS herangezogen.

(2) [1]Die Studierenden haben die für die Anerkennung erforderlichen Unterlagen vorzulegen. [2]Studierende, die neu in den Studiengang Bioingenieurwesen immatrikuliert wurden, haben den Antrag mit den für die Anerkennung erforderlichen Unterlagen innerhalb des ersten Semesters nach Immatrikulation zu stellen. [3]Bei Unterlagen, die nicht in deutscher oder englischer Sprache vorliegen, kann eine amtlich beglaubigte Übersetzung verlangt werden. [4]Die Beweislast dafür, dass der Antrag die Voraussetzungen für die Anerkennung nicht erfüllt, liegt beim Prüfungsausschuss.

(3) [1]Werden Leistungen angerechnet, die nicht am KIT erbracht wurden, werden sie im Zeugnis als „anerkannt“ ausgewiesen. [2]Liegen Noten vor, werden die Noten, soweit die Notensysteme vergleichbar sind, übernommen und in die Berechnung der Modulnoten und der Gesamtnote einbezogen. [3]Sind die Notensysteme nicht vergleichbar, können die Noten umgerechnet werden. [4]Liegen keine Noten vor, wird der Vermerk „bestanden“ aufgenommen.

(4) [1]Bei der Anerkennung von Studien- und Prüfungsleistungen, die außerhalb der Bundesrepublik Deutschland erbracht wurden, sind die von der Kultusministerkonferenz und der Hochschulrektorenkonferenz gebilligten Äquivalenzvereinbarungen sowie Absprachen im Rahmen der Hochschulpartnerschaften zu beachten.

(5) [1]Außerhalb des Hochschulsystems erworbene Kenntnisse und Fähigkeiten werden angerechnet, wenn sie nach Inhalt und Niveau den Studien- und Prüfungsleistungen gleichwertig sind, die ersetzt werden sollen und die Institution, in der die Kenntnisse und Fähigkeiten erworben wurden, ein genormtes Qualitätssicherungssystem hat. [2]Die Anrechnung kann in Teilen versagt werden, wenn mehr als 50 Prozent des Hochschulstudiums ersetzt werden soll.

(6) [1]Zuständig für Anerkennung und Anrechnung ist der Prüfungsausschuss. [2]Im Rahmen der Feststellung, ob ein wesentlicher Unterschied im Sinne des Absatz 1 vorliegt, sind die zuständigen Fachvertreter/innen zu hören.

II. Bachelorprüfung

§ 20 Umfang und Art der Bachelorprüfung

(1) [1]Die Bachelorprüfung besteht aus den Modulprüfungen nach Absatz 2 sowie dem Modul Bachelorarbeit (§ 14).

(2) [1]Es sind Modulprüfungen in folgenden Pflichtfächern abzulegen:

1. Fach: Mathematisch-Naturwissenschaftliche Grundlagen
   Module im Umfang von 52 LP,
2. Fach: Ingenieurwissenschaftliche Grundlagen
   Module im Umfang von 48 LP,
3. Fach: Verfahrenstechnische Grundlagen
   Modul(e) im Umfang von 22 LP,
4. Fach: Wahlbereich Verfahrenstechnik
   Module im Umfang von 28 LP,

5. Fach: Profilfach
Modul(e) im Umfang von 12 LP,

6. Fach: Überfachliche Qualifikationen
Modul(e) im Umfang von 6 LP gemäß § 16.

[2]Die Festlegung der zur Auswahl stehenden Module und deren Fachzuordnung werden im Modulhandbuch getroffen.

§ 21 Bestehen der Bachelorprüfung, Bildung der Gesamtnote

(1) [1]Die Bachelorprüfung ist bestanden, wenn alle in § 20 genannten Modulprüfungen mindestens mit „ausreichend“ bewertet wurden.

(2) [1]Die Gesamtnote der Bachelorprüfung errechnet sich als ein mit Leistungspunkten gewichteter Notendurchschnitt der Fachnoten sowie des Moduls Bachelorarbeit.

[2]Dabei wird die Note des Moduls Bachelorarbeit mit dem doppelten Gewicht der Noten der übrigen Fächer berücksichtigt.

(3) [1]Haben Studierende die Bachelorarbeit mit der Note 1,0 und die Bachelorprüfung mit einem Durchschnitt von 1,2 oder besser abgeschlossen, so wird das Prädikat „mit Auszeichnung“ (with distinction) verliehen.

§ 22 Bachelorzeugnis, Bachelorurkunde, Diploma Supplement und Transcript of Records

(1) [1]Über die Bachelorprüfung werden nach Bewertung der letzten Prüfungsleistung eine Bachelorurkunde und ein Zeugnis erstellt. [2]Die Ausfertigung von Bachelorurkunde und Zeugnis soll nicht später als drei Monate nach Ablegen der letzten Prüfungsleistung erfolgen. [3]Bachelorurkunde und Bachelorzeugnis werden in deutscher und englischer Sprache ausgestellt. [4]Bachelorurkunde und Zeugnis tragen das Datum der erfolgreichen Erbringung der letzten Prüfungsleistung. [5]Diese Dokumente werden den Studierenden zusammen ausgehändigt. [6]In der Bachelorurkunde wird die Verleihung des akademischen Bachelorgrades beurkundet. [7]Die Bachelorurkunde wird von dem Präsidenten und der KIT-Dekanin/dem KIT-Dekan der KIT-Fakultät unterzeichnet und mit dem Siegel des KIT versehen.

(2) [1]Das Zeugnis enthält die Fach- und Modulnoten sowie die den Modulen und Fächern zugeordneten Leistungspunkte und die Gesamtnote. [2]Sofern gemäß § 7 Absatz 2 Satz 2 eine differenzierte Bewertung einzelner Prüfungsleistungen vorgenommen wurde, wird auf dem Zeugnis auch die entsprechende Dezimalnote ausgewiesen; § 7 Absatz 4 bleibt unberührt. [3]Das Zeugnis ist von der KIT-Dekanin/dem KIT-Dekan der KIT-Fakultät und von der/dem Vorsitzenden des Prüfungsausschusses zu unterzeichnen.

(3) [1]Mit dem Zeugnis erhalten die Studierenden ein Diploma Supplement in deutscher und englischer Sprache, das den Vorgaben des jeweils gültigen ECTS Users‘ Guide entspricht, sowie ein Transcript of Records in deutscher und englischer Sprache.

(4) [1]Das Transcript of Records enthält in strukturierter Form alle erbrachten Studien- und Prüfungsleistungen. [2]Dies beinhaltet alle Fächer und Fachnoten samt den zugeordneten Leistungspunkten, die dem jeweiligen Fach zugeordneten Module mit den Modulnoten und zugeordneten Leistungspunkten sowie die den Modulen zugeordneten Erfolgskontrollen samt Noten und zugeordneten Leistungspunkten. [3]Absatz 2 Satz 2 gilt entsprechend. [4]Aus dem Transcript of Records soll die Zugehörigkeit von Erfolgskontrollen zu den einzelnen Modulen deutlich erkennbar sein. [5]Angerechnete Studien- und Prüfungsleistungen sind im Transcript of Records aufzunehmen. [6]Alle Zusatzleistungen werden im Transcript of Records aufgeführt.

(5) [1]Die Bachelorurkunde, das Bachelorzeugnis und das Diploma Supplement einschließlich des Transcript of Records werden vom Studierendenservice des KIT ausgestellt.

III. Schlussbestimmungen

§ 23 Bescheinigung von Prüfungsleistungen

[1]Haben Studierende die Bachelorprüfung endgültig nicht bestanden, wird ihnen auf Antrag und gegen Vorlage der Exmatrikulationsbescheinigung eine schriftliche Bescheinigung ausgestellt, die die erbrachten Studien- und Prüfungsleistungen und deren Noten enthält und erkennen lässt, dass die Prüfung insgesamt nicht bestanden ist. [2]Dasselbe gilt, wenn der Prüfungsanspruch erloschen ist.

§ 24 Aberkennung des Bachelorgrades

(1) [1]Haben Studierende bei einer Prüfungsleistung getäuscht und wird diese Tatsache nach der Aushändigung des Zeugnisses bekannt, so können die Noten der Modulprüfungen, bei denen getäuscht wurde, berichtigt werden. [2]Gegebenenfalls kann die Modulprüfung für „nicht ausreichend“ (5,0) und die Bachelorprüfung für „nicht bestanden“ erklärt werden.

(2) [1]Waren die Voraussetzungen für die Zulassung zu einer Prüfung nicht erfüllt, ohne dass die/der Studierende darüber täuschen wollte, und wird diese Tatsache erst nach Aushändigung des Zeugnisses bekannt, wird dieser Mangel durch das Bestehen der Prüfung geheilt. [2]Hat die/der Studierende die Zulassung vorsätzlich zu Unrecht erwirkt, so kann die Modulprüfung für „nicht ausreichend“ (5,0) und die Bachelorprüfung für „nicht bestanden“ erklärt werden.

(3) [1]Vor einer Entscheidung des Prüfungsausschusses ist Gelegenheit zur Äußerung zu geben.

(4) [1]Das unrichtige Zeugnis ist zu entziehen und gegebenenfalls ein neues zu erteilen. [2]Mit dem unrichtigen Zeugnis ist auch die Bachelorurkunde einzuziehen, wenn die Bachelorprüfung aufgrund einer Täuschung für „nicht bestanden“ erklärt wurde.

(5) [1]Eine Entscheidung nach Absatz 1 und Absatz 2 Satz 2 ist nach einer Frist von fünf Jahren ab dem Datum des Zeugnisses ausgeschlossen.

(6) [1]Die Aberkennung des akademischen Grades richtet sich nach § 36 Absatz 7 Landeshochschulgesetz.

§ 25 Einsicht in die Prüfungsakten

(1) [1]Nach Abschluss der Bachelorprüfung wird den Studierenden auf Antrag innerhalb eines Jahres Einsicht in das Prüfungsexemplar ihrer Bachelorarbeit, die darauf bezogenen Gutachten und in die Prüfungsprotokolle gewährt.

(2) [1]Für die Einsichtnahme in die schriftlichen Modulprüfungen, schriftlichen Modulteilprüfungen bzw. Prüfungsprotokolle gilt eine Frist von einem Monat nach Bekanntgabe des Prüfungsergebnisses.

(3) [1]Der/die Prüfende bestimmt Ort und Zeit der Einsichtnahme.

(4) [1]Prüfungsunterlagen sind mindestens fünf Jahre aufzubewahren.

§ 26 Inkrafttreten, Übergangsvorschriften

(1) [1]Diese Studien- und Prüfungsordnung tritt am 1. Oktober 2023 in Kraft und gilt für

1. Studierende, die ihr Studium im Bachelorstudiengang Bioingenieurwesen am KIT im ersten Fachsemester aufnehmen, sowie für
2. Studierende, die ihr Studium im Bachelorstudiengang Bioingenieurwesen am KIT in einem höheren Fachsemester aufnehmen, sofern dieses Fachsemester nicht über dem Fachsemester liegt, das der erste Jahrgang nach Ziffer 1 erreicht.

(2) [1]Die Studien- und Prüfungsordnung des KIT für den Bachelorstudiengang Bioingenieurwesen vom 5. August 2015 (Amtliche Bekanntmachung des KIT Nummer 75 vom 6. August 2015) zuletzt geändert durch Artikel 4 Satzung zur Änderung der Regelung über die mündliche Nachprüfung in den Studien- und Prüfungsordnungen des Karlsruher Institut für Technologie (KIT)) vom 29. März 2023 (Amtliche Bekanntmachung des KIT Nummer 29 vom 30. März 2023) behält Gültigkeit für

1. Studierende, die ihr Studium im Bachelorstudiengang Bioingenieurwesen am KIT zuletzt im Sommersemester 2023 aufgenommen haben, sowie für
2. Studierende, die ihr Studium im Bachelorstudiengang Bioingenieurwesen am KIT ab dem Wintersemester 2023/2024 in einem höheren Fachsemester aufnehmen, sofern das Fachsemester über dem liegt, das der erste Jahrgang nach Absatz 1 Ziffer 1 erreicht hat.

(3) [1]Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Bioingenieurwesen vom 5. August 2015 (Amtliche Bekanntmachung des KIT Nummer 75 vom 6. August 2015) zuletzt geändert durch Artikel 4 der Satzung zur Änderung der Regelung über die mündliche Nachprüfung in den Studien- und Prüfungsordnungen des Karlsruher Institut für Technologie (KIT) vom 29. März 2023 (Amtliche Bekanntmachung des KIT Nummer 29 vom 30. März 2023) ihr Studium am KIT aufgenommen haben, können Prüfungen auf Grundlage dieser Studien- und Prüfungsordnung letztmalig am 30. September 2028 ablegen.

(4) [1]Studierende, die auf Grundlage der Studien- und Prüfungsordnung für den Bachelorstudiengang Bioingenieurwesen vom 5. August 2015 (Amtliche Bekanntmachung des KIT Nummer 75 vom 6. August 2015) zuletzt geändert durch Artikel 4 der Satzung zur Änderung der Regelung über die mündliche Nachprüfung in den Studien- und Prüfungsordnungen des Karlsruher Institut für Technologie (KIT) vom 29. März 2023 (Amtliche Bekanntmachung des KIT Nummer 29 vom 30. März 2023) ihr Studium am KIT aufgenommen haben, können auf Antrag ihr Studium nach dieser Studien- und Prüfungsordnung fortsetzen.

Karlsruhe, den 27. April 2023

gez. Prof. Dr.-Ing. Holger Hanselka
(Präsident)