Module Handbook
Chemical and Process Engineering Bachelor 2015 (Bachelor of Science (B.Sc.))
SPO 2015
Winter term 2020/21
Date: 25/10/2020

KIT DEPARTMENT OF CHEMICAL AND PROCESS ENGINEERING
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1 Field of study structure

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<td>Fundamentals of Scientific Engineering</td>
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<tr>
<td>Thermodynamics and Transport Processes</td>
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<td>Fundamentals of Process Engineering</td>
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<td>Mandatory Elective Courses</td>
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<tr>
<td>Laboratories</td>
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<tr>
<td>Specialization/ Project Work</td>
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<td>Soft Skill Qualifications</td>
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1.1 Bachelor Thesis

Mandatory

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1.2 Fundamentals of Mathematics and Natural Sciences

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<td>Computational Methods</td>
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<td>M-CHEMBIO-101117</td>
<td>General and Inorganic Chemistry</td>
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<td>M-CHEMBIO-101115</td>
<td>Organic Chemistry for Engineers</td>
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<tr>
<td>M-PHYS-100993</td>
<td>Elementary Physics</td>
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1.3 Fundamentals of Scientific Engineering

Mandatory

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<td>M-CIWVT-101128</td>
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<td>M-MACH-102567</td>
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<tr>
<td>M-MACH-101299</td>
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<td>M-MACH-101300</td>
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First usage possible from 10/1/2017.
# 1 FIELD OF STUDY STRUCTURE

## 1.4 Thermodynamics and Transport Processes

<table>
<thead>
<tr>
<th>Module Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>M-CIWVT-101129</td>
<td>Thermodynamics I</td>
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<tr>
<td>M-CIWVT-101130</td>
<td>Thermodynamics II</td>
<td>7 CR</td>
</tr>
<tr>
<td>M-CIWVT-101131</td>
<td>Fluidynamics</td>
<td>5 CR</td>
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<tr>
<td>M-CIWVT-101132</td>
<td>Fundamentals of Heat and Mass Transfer</td>
<td>7 CR</td>
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## 1.5 Fundamentals of Process Engineering

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<td>Mechanical Processing</td>
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<td>M-CIWVT-101134</td>
<td>Thermal Process Engineering</td>
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<tr>
<td>M-CIWVT-101133</td>
<td>Chemical Process Engineering</td>
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</table>

## 1.6 Mandatory Elective Courses

**Election notes**
In most cases, two modules totaling 10 ECTS are chosen (regardless of whether the modules are offered in the summer or winter term). For most optional subjects, participation is not recommended before the fourth semester.

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Module Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>M-CIWVT-101124</td>
<td>Downstream Processing</td>
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<td>M-CIWVT-101126</td>
<td>Food Biotechnology</td>
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<tr>
<td>M-CIWVT-101136</td>
<td>Energy Process Engineering</td>
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<tr>
<td>M-CIWVT-101137</td>
<td>Industrial Organic Chemistry</td>
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<td>M-CIWVT-101972</td>
<td>International Concepts of Water Technologies</td>
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<td>M-CIWVT-101624</td>
<td>Biology for Engineers I</td>
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<td>M-CIWVT-103297</td>
<td>Applied Apparatus Engineering</td>
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<td>M-MACH-102829</td>
<td>Mechanical Design III+IV</td>
<td>13 CR</td>
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<tr>
<td>M-CIWVT-105517</td>
<td>Industrial Microbiology</td>
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<tr>
<td>M-CIWVT-105518</td>
<td>Enzyme Technology</td>
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## 1.7 Laboratories

<table>
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<tr>
<th>Module Code</th>
<th>Module Name</th>
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<tr>
<td>M-CIWVT-101138</td>
<td>Lab Work Process Engineering</td>
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<tr>
<td>M-CIWVT-101964</td>
<td>Laboratory Work in General and Inorganic Chemistry</td>
<td>6 CR</td>
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<tr>
<td>M-CIWVT-101139</td>
<td>Process Machines</td>
<td>5 CR</td>
</tr>
<tr>
<td>M-CHEMBIO-101116</td>
<td>Practical Course in Organic Chemistry for Chemical Engineers</td>
<td>5 CR</td>
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</table>
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 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 on 12 July 2019 in which the individual subjects will be presented and the registration procedure explained.

The location and time of the information event will be published in good time on the faculty's and student council's homepages.

The registration process is divided into two stages:
In July, the desired profile subjects can be selected via the following portal https://portal.wiwi.kit.edu/
After the allocation you can choose your specialization subject in the Study Portal, the choice is approved online by the faculty, afterwards the registration for the individual examinations is possible.

**Election regulations**
Elections in this field require confirmation.

<table>
<thead>
<tr>
<th>Election block: Specialization/ Project Work (at least 12 credits)</th>
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<tr>
<td>M-CIWVT-101144 Rheology and Product Design</td>
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<tr>
<td>M-CIWVT-101145 Energy and Environmental Engineering</td>
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<tr>
<td>M-CIWVT-101147 Mechanical Separation Technology</td>
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<tr>
<td>M-CIWVT-101148 Food Technology</td>
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<td>M-CIWVT-101140 Catalytic Reaction Engineering</td>
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<tr>
<td>M-CIWVT-101143 Biotechnology</td>
<td>12 CR</td>
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<tr>
<td>M-CIWVT-101152 Water Quality and Process Engineering of Water and Waste Water Treatment</td>
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<td>M-CIWVT-101154 Micro Process Engineering</td>
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<td>M-CIWVT-101153 Process Development and Scale-up</td>
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<td>M-CIWVT-104457 Fundamentals of Refrigeration</td>
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<td>M-CIWVT-104458 Applied Thermal Process Engineering</td>
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1.9 Soft Skill Qualifications

A total of 6 LPs must be completed in the area of "soft skill qualifications" during the Bachelor's programme. 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.

3 of the 6 LPs are fixed: At least one of the modules "Ethics and Global Material Cycles" and/or "Industrial Business Administration" must be selected (scope 3 LP each).

Modules in the range of 3 LP can be freely selected. The following can be done:

- either both modules "Industrial Business Administration" and "Ethics and Global Material Cycles"
- or any modules of at least 3 LP (e.g. HoC or ZaK courses)

can be selected.

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<tr>
<td>M-WIWI-100528 Industrial Business Administration</td>
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2 Modules

2.1 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

<table>
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**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.

**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.

**Module grade calculation**

The module grade is the grade of the written examination

**Prerequisites**

none

**Content**

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

**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.
2.2 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

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**Competence Certificate**

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

**Competence Goal**

The students know about the fundamentals of linear algebra. They 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.

**Module grade calculation**

The module grade is the grade of the written examination.

**Prerequisites**

none

**Content**

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

**Recommendation**

The following modules should have been taken: Advanced Mathematics 1

**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.
### 2.3 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

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<td>Advanced Mathematics III</td>
<td>7 CR Arens, Griesmaier, Hettlich</td>
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<td>Tutorial Advanced Mathematics III</td>
<td>0 CR Arens, Griesmaier, Hettlich</td>
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**Competence Certificate**

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

**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.

**Module grade calculation**

The module grade is the grade of the written examination.

**Prerequisites**

none

**Content**

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

**Recommendation**

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

**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.
M 2.4 Module: Applied Apparatus Engineering [M-CIWVT-103297]

Responsible: Dr. Martin Neuberger
Organisation: KIT Department of Chemical and Process Engineering
Part of: Mandatory Elective Courses

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Competence Certificate
Success Control is an written examination of 90 minutes duration according to § 4 Abs. 2 Nr. 1 SPO.

Competence Goal
The students will be able to describe the necessary steps for concept, planning and calculation of a construction of a machine until the commissioning. This contains the choice and declaration of single components. The students will apply the principles of the machine design with respect to the requirements for different educts, products and processes. Additionally to technical aspects, the students will learn about cost management, time management and quality management. The students will know the sequence of licensing and providing procedures.

Prerequisites
None

Content
Project Management
- Project time management, project cost management, work breakdown structure

Process of Machine Design
- Product (requirements with respect to corrosion, purity, cleanliness ...), process (manufacturing, pressure, temperature, ...),
- selection of materials and components (motors, pumps, vans, fittings), maintenance, repair, safety, manufacturing process (welding, brazing ...), transport, commissioning, performance test, approval ...

Procurement
- Technical specification, call for tenders, contract design, claim management

Quality Management
- Certification concerning ISO 9001:2015, quality planning, quality approval
- e.g. welding process qualification, qualified welders ...
- material qualification report, control of manufacturing and mounting, commissioning

Workload
- Attendance time: 60 h
- Self-study: 45 h
- Exam preparation: 45 h

Literature
Walter Wagner: Planung im Anlagenbau; Vogel Business Media; Auflage: 3. Auflage (August 2009)
### 2.5 Module: Applied Thermal Process Engineering [M-CIWVT-104458]

**Responsible:** Dr.-Ing. Benjamin Dietrich  
Dr. Philip Scharfer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Specialization / Project Work

**Credits**  
12

**Recurrence**  
Each winter term

**Language**  
German

**Level**  
3

**Version**  
3

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<td>6 CR</td>
<td>Each winter term</td>
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**Competence Goal**

Students can

- explain basic, future-oriented processes of applied thermal process engineering
- process chain of a scientific question up to its answer: planning, conceptual design, implementation, execution and evaluation of fundamental experiments, describing aspects for implementation on a technical scale (scale-up)
- work scientifically using standard IT tools
- present scientific results
- independently acquire specialist knowledge

**Prerequisites**

Participation requires

- minimum 60 ECTS
- minimum 1 lab course

**Modeled Conditions**

The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

**Content**

Within the scope of this module an insight into the current research of the institute is to be made possible, which deals with future-oriented topics, such as renewable energy concepts, electromobility and energy storage. Three basic experiments in the fields of drying, heat transfer and crystallization are offered in the form of a project work.

First, the corresponding technical and methodological fundamentals are presented in a lecture. This also includes the transfer of necessary knowledge for the preparation of a scientific report or a scientific presentation as well as the use of special Excel tools such as solvers or macros. In special workshops at the TVT the lecture contents can be trained. Subsequently, experiments are carried out in the laboratory using modern, partly self-assembled measuring technology (e.g. temperature sensors based on single board computers / Arduino) on the respective topic. The evaluation is carried out using the basics laid down in the lecture and with the aid of corresponding chapters of the VDI heat atlas. The results are summarized in a work report and are presented in a lecture. In the following step, a design calculation for the industrial scale-up with corresponding specifications of the required devices is prepared for one of the basic experiments. The design achieved is to be presented to the other students of the profile subject in a scientific seminar. The practical part is rounded off by an excursion to BASF in Ludwigshafen, which provides insights into the application of what has been learned in industrial implementation.

**Recommendation**

The successful participation in the lecture "Basics of Heat an Mass Transfer" of the TVT ist an advantage.
Workload
Lectures and exercises: 100 h
Homework: 160 h
Laboratory work (incl. interpretation and report): 100 h

Literature
- VDI-Wärmeatlas, Springer 2013
- Own Manuscripts
Module: Biology for Engineers I (BIW-TEBI-01) [M-CIWVT-101624]

Responsible: Prof. Dr. Christoph Syldatk
Organisation: KIT Department of Chemical and Process Engineering
Part of: Mandatory Elective Courses

Credits: 5
Recurrence: Each winter term
Language: German
Level: 3
Version: 2

Competence Certificate
The module is successfully completed by
- a written exam “Cell Biology” of 90 min (according to § 4 Abs. 2 SPO)
- a written exam “Genetics” of 90 min (according to § 4 Abs. 2 SPO)

Competence Goal
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, mechanisms 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 transferring their knowledge to gene technological methods.

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

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

Prerequisites
None

Content
Cell biology: Microscopy; Cell structure of pro- and eukaryotes; Eukaryotic cell compartments; 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.

Recommendation
None

Workload
Attendance time: Lecture of 4 SWS ? 60 h
Self-study time: 30 h
Exam preparation: 60 h

Literature
Zellbiologie:
Alberts, Lehrbuch Molekulare Zellbiologie (Wiley-VCH)
Genetik:
Munk, Taschenlehrbuch Biologie, Genetik (Thieme)
Knippers, Genetik (Thieme)
2.7 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

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**Competence Certificate**

The module comprises two graded success controls according to § 4 (2) No 2,3 SPO:

1. written examination
2. practical work / protocol / presentation

The module grade is calculated from both parts of the module, part 1: 25%, part 2: 75%

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6).

**Competence Goal**

Basic understanding of processes and synthesis of processes in biotechnologic production

**lecture „Instrumental Bioanalytics“**

The students are able to assign important methods of instrumental biotechnology to corresponding analytical problems. By deepening their theoretical understanding of physical-chemical analytics and working techniques the students become qualified to analyze fields of application and constraints thereof. They can compare/evaluate potentials and limitations of different methods and select suitable methods for (future) experimental work on their own.

**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 can 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.

**Module grade calculation**

weighted mean based on LP

**Prerequisites**

Participation requires

- minimum 60 ECTS
- minimum 1 lab course
Modeled Conditions
The following conditions have to be fulfilled:

1. You have to fulfill one of 6 conditions:
   1. The module M-CIWVT-101138 - Lab Work Process Engineering must have been passed.
   2. The module M-CIWVT-101139 - Process Machines must have been passed.
   3. The module M-CIWVT-101722 - General Chemistry and Chemistry of Aqueous Solutions must have been passed.
   4. The module M-CIWVT-101964 - Laboratory Work in General and Inorganic Chemistry must have been passed.
   5. The module M-CHEMBIO-101115 - Organic Chemistry for Engineers must have been passed.
   6. The course T-CIWVT-103331 - Laboratory Work: Biology for Engineers must have been passed.

2. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

Content
lecture „Instrumental Bioanalytics“
The lecture introduces to important instrumental methods in biotechnology including both theory and possible fields of application. Methods covered in the lecture are chromatographic separation techniques, spectroscopic structure analysis (MS, NMR, IR, absorption and fluorescence) as well as special microscopic techniques (fluorescence, CLSM, EM and SNOM). Beyond that, scanning probe microscopy and single molecule spectroscopy will be introduced.

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

Workload
Instrumental Bioanalytics (3 ECTS):
   - Lectures and Exercises: 28 h
   - Homework: 30 h
   - Exam Preparation: 32 h

Management of scientific projects (3 ECTS):
   - Lectures and Exercises: 28 h
   - Homework: 64 h

Lab Work: (3 ECTS):
   - Lab: 80 h
   - Homework: 10 h

Project (3 ECTS)
   - Lab: 10 h
   - Homework: 80 h

Literature
Will be announced.
Module: Catalytic Reaction Engineering (CIW-CVT-02) [M-CIWVT-101140]

**Responsible:** Prof. Dr. Bettina Kraushaar-Czarnetzki

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Specialization/ Project Work

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<td>4 CR</td>
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**Competence Certificate**

Graded: oral (written in case of overload) examinations for the lectures; written report and presentation for the project work

The module grade is calculated from the LP-weighted mean of both parts of the module.

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6) of SPO.

**Competence Goal**

Students can analyse and design chemical reactors for conversions of two- and three-phase reaction mixtures. They are able to identify processing conditions for efficient, selective and safe operation. Furthermore, they are familiar with the functions, the manufacturing techniques and the important characterisation methods of heterogeneous catalysts, and with the prominent mechanistic models used to explain catalytic effects.

**Module grade calculation**

Weighted mean based on LP

**Prerequisites**

Participation requires

- minimum 60 ECTS
- minimum 1 lab course

**Modeled Conditions**

The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

**Content**

Multiphase reaction engineering and heterogeneous catalysis including modeling and applications to practical technical topics.

**Workload**

360 h

**Learning type**

22122 Chemical Process Engineering II, 1 V, 2 LP
22123 Exercises to Chemical Process Engineering II, 1 Ü, 2 LP
22125 Heterogeneous Catalysis I, 2 V, 4 LP
project work with excursion, 5 SWS, 4 LP
Literature
B. Kraushaar-Czarnetzki: Lecture notes "Chemische Verfahrenstechnik II" (https://studium.kit.edu).
B. Kraushaar-Czarnetzki: Lecture notes "Heterogene Katalyse I" (https://studium.kit.edu).
Topical references to special literature are given in the above mentioned lecture notes.
Module: Chemical Process Engineering (CIW-CVT-01) [M-CIWVT-101133]

Responsible: Prof. Dr. Bettina Kraushaar-Czarnetzki
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Process Engineering

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Mandatory

T-CIWVT-101884 Chemical Process Engineering 6 CR Kraushaar-Czarnetzki

Competence Certificate
Learning control is a written examination of 120 min duration according to §4 Abs. 2 Nr. 1 SPO

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.

Module grade calculation
Grade of the written examination

Prerequisites
None

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.

Recommendation
Courses of 1st - 4th semester

Workload
lecture: 56 h
self-study: 56 h
preparation of examination. 68 h

Literature
B. Kraushaar-Czarnetzki: "Klausuren mit Lösungen" (Studentenwerk).
2.10 Module: Computational Methods [M-CIWVT-101956]

**Responsible:** Dr. Peter Habisreuther

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Fundamentals of Mathematics and Natural Sciences

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<td>Application of Numerics in Engineering</td>
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**Competence Goal**

Higher programming languages, design and description of algorithms, basic algorithms from mathematics and computer science, implementation of mathematical concepts on computers, modeling and simulation of scientific and technical problems.

Students are able to solve engineering problems applying numerical methods, to solve a problem within a fixed time-frame in a team and to show their results in a concluding presentation.

**Prerequisites**

None

**Content**

The course offers the basics to advanced studies. Key concepts of the lectures are: structured program design, iteration, recursion, data structures (in particular: arrays), procedural programming with functions and methods, developing application-oriented programs. In computer labs, the mathematical concepts will be implemented.

Fundamentals to solve problems in process engineering by applying numerical methods.
Module: Control Engineering and System Dynamics (CIW-MACH-04) [M-MACH-101300]

Responsible: Prof. Dr.-Ing. Christoph Stiller
Organisation: KIT Department of Mechanical Engineering
Part of: Fundamentals of Scientific Engineering

Credits: 5
Recurrence: Each summer term
Duration: 1 term
Language: German
Level: 3
Version: 2

Mandatory

T-MACH-102126 Control Engineering and System Dynamics

Competence Certificate
Type of Examination: written exam
Duration of Examination: 120 minutes

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

Module grade calculation
grade of the written examination

Prerequisites
Compulsory preconditions: none
Recommendation: courses of 1st -3rd semester

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

Workload
150 hours

Learning type
2138332 Regelungstechnik und System-dynamik, 2V, 2 LP, compulsory course
2138333 Übungen zu Regelungstechnik und Systemdynamik, 1Ü, 2 LP, compulsory course

Literature
Stiller: Grundlagen der Mess- und Regelungstechnik, Shaker Verlag
2.12 Module: Downstream Processing (BIW-MAB-02) [M-CIWVT-101124]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Mandatory Elective Courses

Credits: 7
Recurrence: Each summer term
Duration: 1 term
Language: German
Level: 4
Version: 2

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Competence Certificate
Learning control consist of

- written examination of 120 min duration according to § 4 Abs. 2 SPO
- Lab work

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

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

Prerequisites
None

Content
The lecture series addresses fundamentals in biotechnological purification of bio-products and respective analytics.

Recommendation
Courses of 1st - 3rd semester

Workload
Lectures and exercises: 56h
Homework: 50 h
preparation of examination: 44 h
Lab Work (one week):
Attendance time: 40 h
preparation and reports: 20 h

Literature
will be announced
2.13 Module: Elementary Physics [M-PHYS-100993]

**Responsible:** Prof. Dr. Bernd Pilawa

**Organisation:** KIT Department of Physics

**Part of:** Fundamentals of Mathematics and Natural Sciences

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| T-PHYS-101577 | Elementary Physics | 7 CR | Pilawa, Ustinov |

**Competence Certificate**

See components of this module

**Prerequisites**

The modules Advanced Mathematics I and Advanced Mathematics II have to be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module M-MATH-100280 - Advanced Mathematics I must have been passed.
2. The module M-MATH-100281 - Advanced Mathematics II must have been passed.

**Recommendation**

Contents of *Engineering Mechanics: Dynamics*
2.14 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

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**Mandatory**

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<td>Energy and Environmental Engineering Project Work</td>
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**Competence Certificate**
The module comprises two graded success controls according to § 4 (2) No. 1, 3 SPO:
- written examination, duration 120 minutes
- project work

The module grade is calculated from the LP-weighted mean of both parts of the module.

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6) of SPO.

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

**Prerequisites**
Participation requires
- minimum 60 ECTS
- minimum 1 lab course

**Modeled Conditions**
The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

**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.

**Recommendation**
Courses of 1st - 4th semester

**Workload**
- Attendance time: 60 h
- Excursions: 20 h
- Self-Study: 90 h
- Project work: 90 h
- Exam preparation: 100 h
Literature
lecture notes and specific literature indicated during lectures, additionally:
M. Crocker (Hrsg.): Thermochemical Conversion of Biomass to Liquid Fuels and Chemicals, Springer-Verlag, Berlin 2010
### Module: Energy Process Engineering (CIW-CEB-02) [M-CIWVT-101136]

**Responsible:** Prof. Dr.-Ing. Thomas Kolb  
Prof. Dr.-Ing. Nikolaos Zarzalis

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Mandatory Elective Courses

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**Competence Certificate**

Learning control is a written examination of 150 min duration according to § 4 Abs. 2 SPO.

**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.

**Module grade calculation**

Grade of the written examination

**Prerequisites**

None.

**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

**Recommendation**

Thermodynamik

**Workload**

- Lectures: 56 h
- Self-study: 50 h
- Preparation of examination: 44 h

**Literature**

In the lecture stated literature, additionally:

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

**Responsible:** Prof. Dr. Roland Dittmeyer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Fundamentals of Scientific Engineering

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**Competence Certificate**
Assessment of success takes place via
1. a written examination of 90 minutes according to § 4, passage 2 of the Studies and Examinations Regulations (SPO)
2. prerequisite

**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.

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

**Prerequisites**
None

**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;

**Recommendation**
modules of 1. - 2. semester.

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

**Literature**
Kühlhorn/Silber: Technische Mechanik für Ingenieure, Hüthig 2000
Hibbler: Dynamik, Pearson 2006, 10. Auflage
Wriggers/Nackenhorst/Beuermann/Spiess/Löhnert: Technische Mechanik kompakt, Teubner2006

Responsible: Prof. Dr. Norbert Willenbacher
Organisation: KIT Department of Chemical and Process Engineering
Part of: Fundamentals of Scientific Engineering (Usage from 10/1/2017)

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Competence Certificate
Learning Control consists of:

- A written examination "Statics" according § 4 (2) No 1 SPO. Duration: 90 minutes.
- A written examination "Strength of Material" according § 4 (2) No 1 SPO. Duration: 90 minutes.

Module grade calculation
ECTS-weighted mean.

Prerequisites
None

Content
forces and momentums, static balance, bearings, frameworks, tension/elongation in general (3D), internal force variables of beams, friction, principle of virtual work, tension/elongation in rods, hypothesis of stability, torsion, buckling

Workload
Attendance time: 120 h
Self-study: 120 h
Exam preparation: 60 h

Literature
Gross/Hauger/Schnell/Schröder: Technische Mechanik
Hibbeler: Technische Mechanik 1- Statik, Pearson 2005, 10. Auflage;
Technische Mechanik 2 - Festigkeitslehre,
Pearson (2006) 5. Auflage,
Mechanics of Materials, Pearson (2004),
Kühnhorn/Silber: Technische Mechanik für Ingenieure, Hüthig 2000
Wriggers/Nackenhorst/Beuermann/Spiess/Löhnert: Technische Mechanik kompakt, Teubner 2006
Müller/Ferber: Technische Mechanik für Ingenieure (mit CD-Rom), Fachbuchverlag Leipzig 2005;
2.18 Module: Enzyme Technology [M-CIWVT-105518]

**Responsible:** Dr. Jens Rudat  
Prof. Dr. Christoph Syldatk

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Mandatory Elective Courses (Usage from 10/1/2020)

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**Mandatory**

| T-CIWVT-111094 | Enzyme Technology | 5 CR | Rudat, Syldatk |

**Competence Certificate**
Learning Control is a written examination according to § 4 Abs. 2 Nr. 1 SPO.

**Module grade calculation**
The grade of module ist the grade of written examination.

**Prerequisites**
None.

**Workload**
- Lectures: 60 h  
- Homework: 40 h  
- Exam Preparation: 50 h

**Literature**
- Voet/Voet/Pratt: "Lehrbuch der Biochemie" (Wiley-VCH)  
- Koolman/Röhm Taschenatlas der Biochemie (Thieme)  
Module: Ethics and Global Material Cycles (CIW-CEB-01) [M-CIWVT-101149]

Responsible: Prof. Dr. Reinhard Rauch  
Organisation: KIT Department of Chemical and Process Engineering  
Part of: Soft Skill Qualifications

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Mandatory

| T-CIWVT-101887 | Ethics and Global Material Cycles | 3 CR | Rauch |
| T-CIWVT-109219 | Ethics and Global Material Cycles - Prerequisite | 0 CR | Rauch |

Competence Certificate

Examination consists of

1. Prerequisite: regular attendance at lectures and exercises; short presentation
2. Written examination (ILIAS)

Competence Goal

Basic understanding of: Examples of global material cycles and effects caused by human societies, Important limitations for material and energy conversion by human societies (civilization, industrialization), Basic knowledge in engineering ethics, Competences in "handling" with ethical questions for engineers

Module grade calculation

Not applicable

Prerequisites

Prerequisite has to be passed for admittance to the written examination.

Content

Bio-geosphere as environment for human life. selected examples of global material cycles. limits of man-made material and energy conversion. sustainability as term. priority rules for sustainability and for shaping the future. technology assessment, engineering codes. responsibility individual, collective, corporate

Workload

- lectures and exercises: 15 h
- homework: 45 h
- preparation of examination: 30 h

Literature

2.20 Module: Fluidodynamics (CIW-MVMV-03) [M-CIWVT-101131]

**Responsible:** Prof. Dr.-Ing. Hermann Nirschl

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Thermodynamics and Transport Processes

**Credits** 5  
**Recurrence** Each summer term  
**Duration** 1 term  
**Language** German  
**Level** 3  
**Version** 2

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<td>T-CIWVT-101904</td>
<td>Fluidodynamics, Tutorial</td>
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**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

**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.

**Module grade calculation**

grade of the written examination

**Prerequisites**

none

**Content**

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

**Recommendation**

Courses of 1st - 3rd semester

**Workload**

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

**Literature**

Nirschl, Zarzalis: Skriptum Fluidmechanik  
Zierep: Grundzüge der Strömungslehre, Teubner 2008  
Prandtl: Führer durch die Strömungslehre, Teubner 2008
Module: Food Biotechnology (BIW-LVT-02) [M-CIWVT-101126]

2.21 Module: Food Biotechnology (BIW-LVT-02) [M-CIWVT-101126]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: Mandatory Elective Courses

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Competence Certificate
The Module comprises two sucess controls:
1. written examination
2. non-granded precondition for the admission to the examination: short presentations

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

Module grade calculation
grade of the written examination.

Prerequisites
None

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 taught. 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.

Recommendation
Courses of 1st semester

Workload
Attendance time: 60 h
Preparation of presentation: 10 h
Exam Preparation: 20 h
homework: 60 h

Literature
Lebensmittelmiikrobiologie (J. Krämer, UTB Ulmer)
Lebensmittelbiotechnologie (Heinz Rutlof, Akademie Verlag)
Lebensmittelverfahrenstechnik, Teil A (Schuchmann, Wiley)
Lebensmittelbiotechnologie: eine Einführung (P. Czemak, GIT)
Lebensmittelbiotechnologe (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)
2.22 Module: Food Technology (CIW-LVT-03) [M-CIWVT-101148]

**Responsible:** Dr.-Ing. Azad Emin

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Specialization / Project Work

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**Competence Certificate**
The Module comprises two graded success controls according to § 4 (2) No 2, 3 SPO:

1. Oral examination, duration about 45 minutes
2. Project work (presentation and report of results)

The module grade is calculated from the LP-weighted mean of both parts of the module.

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6) of SPO.

**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.

**Module grade calculation**

Weighted mean based on LP

**Prerequisites**

Participation requires

- minimum 60 ECTS
- minimum 1 lab course

**Modeled Conditions**
The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

**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

**Workload**

Attendance time: 115 h
(lecture 1 SWS, exercises 1 SWS, project work 5 SWS)
self study: 185 h
exam preparation: 60 h
**Literature**

Will be offered within the lecture, depending on products available.
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:** Thermodynamics and Transport Processes

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**Mandatory**


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

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

**Module grade calculation**  
Grade of the written examination

**Prerequisites**  
none

**Content**  
Heat Transfer: Definitions - System, balances and conservation equations, konetics of heat transfer (Fourier's law), dimensionless numbers, heat conduction, heat radiation, heat transfer in solids an between solids and moving fluids as well as in packings and fluidized beds.  
Mass Transfer: Kinetics of mass transfer (Fickian law), equilibrium, diffusion and mass flow, Knudsen- and multicomponent-diffusion, Lewis analogy of heat and mass transfer

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

**Workload**  
lecture: 75 h  
self-study: 55 h  
preparation of examination: 80 h

**Literature**  
Schabel: Stoffübertragung I, Skript
Module: Fundamentals of Refrigeration (CIW-TTK-03) [M-CIWVT-104457]

Organisation: KIT Department of Chemical and Process Engineering
Part of: Specialization/ Project Work

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Competence Certificate
The Module comprises two graded success controls according to § 4 (2) No 2,3:
1. Project work/ presentation
2. Oral exam of about 30 minutes duration
The project work is a prerequisite for the oral examination.
The module grade is calculated from the LP-weighted mean of both parts of the module.
Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6).

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.

Module grade calculation
Weighted mean based on LP

Prerequisites
Participation requires
- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

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.

Recommendation
None
Workload
Attendance time: Lecture 2 SWS, Exercises 1 SWS: 45 h
Self-Study: 60 h
Exam Preparation: 75 h
Project work including presentation: 180 h

Literature
v. Cube, H.L. (Hrsg.), Lehrbuch der Kältetechnik Band 1 und 2, 4. Auflage (1997), C.F. Müller, Heidelberg
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)
Module: General and Inorganic Chemistry (CIW-CHEM-01) [M-CHEMBIO-101117]

**Responsible:** Prof. Dr. Mario Ruben

**Organisation:** KIT Department of Chemistry and Biosciences

**Part of:** Fundamentals of Mathematics and Natural Sciences

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**Mandatory**

| T-CHEMBIO-101866 | General and Inorganic Chemistry | 6 CR Ruben |

**Competence Certificate**

graded: written examination (150 min)

**Competence Goal**

The students get a basic understanding of the inorganic chemistry. With the knowledge of the periodic table of the elements and basic knowledge of the chemical bond the students are able to describe different compounds and to estimate different reactivities.

**Module grade calculation**

grade of the written examination

**Prerequisites**

none

**Content**

Structure of the matter, nuclear models, periodic table of the elements. The chemical bond. Structure of Metals, ion crystals, covalent bonds, metal complexes. Chemical reactions, chemical equilibrium, law of mass action, solubility product. Acids and bases, redox reactions

**Workload**

Lectures and exercises: 56h

Homework and preparation of examination: 94h

**Literature**

Mortimer, Müller (aktuelle Auflage): Chemie, Thieme Verlag

Riedel (aktuelle Auflage): Moderne Anorganische Chemie, de Gruyter Verlag

Hollemann, Wieberg (aktuelle Auflage): Lehrbuch der Anorganischen Chemie, de Gruyter Verlag


2.26 Module: Industrial Business Administration (CIW-WIWI-01) [M-WIWI-100528]

**Responsibility:** Prof. Dr. Wolf Fichtner

**Organisation:** KIT Department of Economics and Management

**Part of:** Soft Skill Qualifications

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**Compentence Certificate**
The assessment of this course is a ungraded written examination (60 min) according to §4(2), 1 of the examination regulation.

**Compentence Goal**
Students are able to describe and differentiate legal forms for industrial enterprises.

Students will gain knowledge about different ways of financing to raise capital.

The students gain knowledge about the basics of financial accounting and are able to record and book performance and capital flows occurring in companies.

The students gain knowledge about different types of cost accounting and are able to apply them.

Students gain knowledge of the basics of investment planning and are able to evaluate investments economically.

The students gain knowledge about the basics of linear optimization and can solve simple optimization problems with the Simplex algorithm.

The students gain knowledge about basic marketing methods and can describe and differentiate them from each other.

The students gain knowledge about basic methods of project management and can apply them to practical examples.

**Prerequisites**
None

**Content**
- Goals and basics
- Legal framework for industrial enterprises
- Financial accounting
- Cost accounting
- Investment calculation
- Optimisation
- Network technique

**Workload**
The total workload for this course is approximately 90 hours.
2.27 Module: Industrial Microbiology [M-CIWVT-105517]

**Responsible:** Prof. Dr.-Ing. Clemens Posten
Prof. Dr. Christoph Syldatk

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Mandatory Elective Courses (Usage from 10/1/2020)

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**Mandatory**

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**Competence Certificate**
Written examination with a duration of 90 minutes (section 4, subsection 2 No. 1 SPO).

**Module grade calculation**
The grade of module ist the grade of written examination.

**Prerequisites**
None

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

**Literature**
- Munk “Taschenlehrbuch Mikrobiologie” (Thieme)
- Cypionka “Grundlagen der Mikrobiologie” (Springer)
- Ratledge & Kristiansen: Basic Biotechnology (Cambridge University Press)
- Posten: Integrated Bioprocesses, De Gruyter, Berlin;
- Vorlesungsunterlagen
Module: Industrial Organic Chemistry (CIW-MAB-03) [M-CIWVT-101137]

Responsible: Prof. Dr.-Ing. Jürgen Hubbuch
Organisation: KIT Department of Chemical and Process Engineering
Part of: Mandatory Elective Courses

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Mandatory

| T-CIWVT-101890 | Industrial Organic Chemistry | 5 CR | Hubbuch, Rauch, Wörner |

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

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.

Module grade calculation
grade of the written examination

Prerequisites
Organic Chemistry

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.

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

Literature
Handouts
Onken, Behr: Chem. Prozeßkunde, Wiley-VCH 1996
Brahm: Polymerchemie kompakt, Hirzel 2009
Tieke: Makromolekulare Chemie, Wiley-VCH 2014
Hesse u.a.: Spektroskop. Methoden in der OC, Thieme 2011
2.29 Module: International Concepts of Water Technologies [M-CIWVT-101972]

**Responsible:** Prof. Dr. Andrea Schäfer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Mandatory Elective Courses

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**Mandatory**

| CR       | T-CIWVT-103704   | International Concepts of Water Technologies | 5 CR | Schäfer |

**Competence Certificate**
Assessment is an assignment of 25 pages and an oral presentation of 15 minutes.

**Competence Goal**
The students can explain concepts of water technologies (e.g. desalination, water reuse, decentralised systems, water & sanitation in international development) in their international context. The fundamentals of relevant water technologies will be understood and mass balances of water, contaminants and energy calculated. Based on these calculations decisions will be made how available water will be treated. After an overview on relevant renewable energies water technologies that are powered with renewable energies will be considered. An important ability in the international context are an understanding of the varying circumstances that are essential for decision making and successful system integration. Contributing factors of cost, operating strategies, cultural awareness, local environment and infrastructure availability are some of those factors to be considered.

**Module grade calculation**
The result is a composite of the Case study report (assignment) and presentation.

**Prerequisites**
English language proficiency

**Content**
Global water issues, international water quality guidelines, concepts of water technologies, desalination, water reuse, water energy nexus, decentralised systems, emergency water supplies, water & sanitation in international development, renewable energies, operating concepts.

**Recommendation**
None.

**Annotation**
The course is held in English and the assignment/presentation are to be prepared in English. Presence is mandatory!

**Literature**
Web of Science & Reference list for basic principles (provided in lectures) predominantly in English language.
Module: Lab Work Process Engineering (CIW-TTK-05) [M-CIWVT-101138]

**Responsible:** Dr. Sokratis Sinanis  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** Laboratories

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**Competence Certificate**
not graded (passed/not passed) succes control:
starting colloquium, practical work, written report

**Competence Goal**
Carrying out successfull experiments. Measurement of physical properties. Evaluation of data and writing a report

**Module grade calculation**
non-graded

**Prerequisites**
written exam "General and Inorganic Chemistry" must be passed.

**Content**
Fundamental experiments over the whole field of chemical engineering

**Workload**
Lab course/ Presence time: 60 h  
(15 Experiments)  
self study (preparation an reports): 120 h

**Literature**
Documents from each institute for the experiments
Module: Laboratory Work in General and Inorganic Chemistry [M-CIWVT-101964]

Responsible: Prof. Dr. Harald Horn
Organisation: KIT Department of Chemical and Process Engineering
Part of: Laboratories

Credits 6
Recurrence Each winter term
Language German
Level 3
Version 3

Mandatory

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<td>T-CIWVT-108294</td>
<td>Laboratory Work in General and Inorganic Chemistry Part II</td>
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Competence Goal
The students receive a basic knowledge of the general chemistry. They can handle chemicals and can perform qualitative and quantitative analysis in aqueous solutions. They can perform calculations, and can apply the necessary tools to understand the context.

Prerequisites
Written exam "General and Inorganic Chemistry" must be passed.

Content
Lab experiments of qualitative analysis and reactions

Workload
presence time: 120 h
self-study: 60 h

Literature
Mortimer, Müller Chemie, 11. Auflage, Thieme Verlag 2014
Riedel, Meyer, Allgemeine und Anorganische Chemie, 11. Auflage, de Gruyter Verlag 2013
Horn, Abbt-Braun: Praktikumsskript, aktuelle Ausgabe, siehe ILIAS Studierendenportal oder Papierversion;
Ruben, Dsoke: Unterlagen im ILIAS Studierendenportal oder Papierversion
2.32 Module: Material Science and Engineering (CIW-MACH-01) [M-MACH-102567]

**Responsible:** Dr.-Ing. Johannes Schneider

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** Fundamentals of Scientific Engineering

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**Mandatory**

| T-MACH-105148 | Examination Material Science I & II | 9 CR | Schneider |

**Competence Certificate**

oral exam

**Competence Goal**

The students are able to describe the relationship between atomic structure, microscopical observations, and properties of solid materials.

The students can describe the typical property profiles and can name applications for the most important engineering materials.

The students are able to describe standard materials characterization methods and can explain the evaluation of these methods. They can judge materials on base of the data obtained by these methods.

The students are able to describe the basic mechanisms of hardening for ferrous and non-ferrous materials and reflect these mechanisms using phase and TTT diagrams.

The students can interpret given phase, TTT or other diagrams relevant for materials science, gather information from them and can correlate them regarding the microstructure evolution.

The students can describe the phenomena correlated with materials science in polymers, metals and ceramics and depict differences.

The students know about standard materials characterization methods and are able to asses materials on base of the data obtained by these methods.

**Module grade calculation**

grade of the oral exam

**Prerequisites**

None
Content
Atomic structure and atomic bonds

Structures of crystalline and amorphous solids

Defects in crystalline solids

Alloys

Transport and transformation phenomena in the solid state

Corrosion

Wear

Mechanical properties

Testing of materials

Ferrous materials

Non-ferrous metals and alloys

Polymers

Engineering ceramics

Composites

Workload
regular attendance: 90 hours
self-study: 180 hours

Learning type
lectures and exercises

Literature
W. Bergmann: Werkstofftechnik I + II, Hanser Verlag, München, 2008/9
M. Merkel: Taschenbuch der Werkstoffe, Hanser Verlag, München, 2008
J.F. Shackelford; Werkstofftechnologie für Ingenieure, Pearson Studium, München, 2008 (E-Book)
lecture notes and lab script
### 2.33 Module: Mechanical Design (CIW-MACH-02) [M-MACH-101299]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** Fundamentals of Scientific Engineering

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<td>Mechanical Design Basics I, Tutorial</td>
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<td>T-MACH-110365</td>
<td>Mechanical Design Basics II, Tutorial</td>
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**Competence Certificate**

Written examination on the contents of Mechanical Design I&II  
Duration: 90 min plus reading time  
Preliminary examination: Successful participation in the preliminary work in the field of Mechanical Design I&II
**Competence Goal**

**Learning objects springs:**
- be able to recognize spring types and explain stress
- identify and describe the properties of a resilient LSS in machine elements presented later on
- understanding and explaining the principle of action
- know and list areas of application for springs
- graphically illustrate the load and the resulting stresses
- be able to describe the degree of species usefulness as a means of lightweight construction
- be able to analyse different solution variants with regard to lightweight construction (use species efficiency)
- being able to explain several springs as a circuit and calculate total spring stiffness

**Learning objects Technical Systems:**
- being able to explain what a technical system is
- "thinking in systems."
- using system technology as an abstraction tool for handling complexity
- recognizing functional relationships of technical systems
- getting to know the concept of function
- being able to use C&C²-A as a means of system technology

**Learning objects Visualization:**
- ability to create and interpret schematics
- using freehand technical drawing as a means of communication
- to be able to apply the technical basics of freehand drawing
- derivation of 2D representations into different perspective representations of technical structures and vice versa
- master reading of technical drawings
- dedicated dimensioning of technical drawings
- create sectional views of technical systems as a technical sketch

**Learning objects Bearings:**
- be able to recognize bearings in machine systems and explain their basic functions
- name bearings (type/type/function) and recognize them in machine systems and technical drawings
- being able to name areas of application and selection criteria for the various bearings and bearing arrangements and explain interrelationships
- ability to functionally explain the design of the bearing definitions in different directions radially/axially and circumferentially
- know and describe selection as an iterative process as an example
- be able to perform dimensioning of bearing arrangements as an example of the engineer's approach to dimensioning machine elements
- develop first ideas for probabilities in predicting the life of machine elements
- recognise from the damage pattern whether static or dynamic overload was the cause of material failure
- calculate equivalent static and dynamic bearing loads from the catalogue and given external forces on the bearing
- being able to name, explain and transfer the basic equation of the dimensioning to the bearing dimensioning

**Learning objectives seals:**
The students...
- can discuss the basic functions of seals
- can describe the physical causes for mass transfer
- can apply the C&C-Model on seals
- can name, describe and apply the three most important classification criteria of seals
- can explain the function of a contacting seal and a non-contacting seal.
- can differentiate the seal types and organize them to the classification criteria.
- can discuss the structure and the effect of a radial shaft seal
- can evaluate radial shaft seals, compression packings, mechanical seals, gap seals and labyrinth seals
- can describe and apply the constructional principle of selffortification
- can describe the stick-slip phenomenon during the movement sequences of a reciprocating seal

**Learning design:**
The students...
- understand the meaning of design
- are able to recognize and implement basic rules and principles of design
- are able to design the connection of partial systems into the total system
- can name requirements of design and take them into account
- know the main groups of manufacturing methods
are able to explain the manufacturing processes
are able to depict a casted design in a drawing clearly, e.g. draft of the mold, no material accumulation, ...
know how components are designed
Know how the production of the components has an effect on their design
Know the requirements and boundary conditions on design

Learning bolted connections:
The students...

- can list and explain various bolt applications.
- can recognize bolt types and explain their function
- can build a C&C² model of a bolted joint and discuss the influences on its function
- can explain the function of a bolted connection with the help of a spring model
- can reproduce, apply and discuss the screw equation.
- Can estimate the load-bearing capacity of low-loaded bolted joints for dimensioning purposes
- Can indicate which bolted joint is to be calculated and which only roughly dimensioned.
- Can carry out the dimensioning of bolted connections as flange connections
- Can create, explain and discuss the force deflection diagram of a bolted connection

Prerequisites
None

Content
MKL I:
Introduction to product development
Tools for visualization (technical drawing)
Product creation as a problem solution
Technical Systems Product Development
  - Systems theorie
  - Contact and Channel Approach C&C²-A

Basics of selected construction and machine elements
  - Federn
  - bearings and fence
  - sealings

The lecture is accompanied by exercises with the following content:
gear workshop
Tools for visualization (technical drawing)
Technical Systems Product Development
  - Systemtheorie
  - Contact and Channel Approach C&C²-A

Exercises for springs
Exercises for bearings and fence

MKL II:

- sealings
- design
- dimensioning
- component connections
- bolts
Workload
MKL1:
presence: 33.5 h
Attendance in lectures: 15 * 1.5 h = 22.5 h
Presence in exercises: 8 * 1.5 h = 12 h
self-study: 56.5 h
Personal preparation and wrap-up of lecture and exercises including the processing of the test certificates and preparation for the exam: 56.5 h
Total: 90 h = 3 LP
MKL2:
Presence: 33 h
Attendance in lectures: 15 * 1.5 h = 22.5 h
Presence in exercises: 7 * 1.5 h = 10.5 h
Self study: 87 h
Personal preparation and wrap-up of lectures and exercises, including the processing of the test certificates and preparation for the exam: 87 h
Total: 150 h = 5 LP
Additional expenditure for degree programs from other disciplines MKL1 + MKL2 in total: 30 h = 1 LP

Learning type
Lecture
Tutorial
Project work during the semester
Online-test
Module: Mechanical Design III+IV (13 LP) [M-MACH-102829]

**Responsible:** Prof. Dr.-Ing. Albert Albers  
Prof. Dr.-Ing. Sven Matthiesen

**Organisation:** KIT Department of Mechanical Engineering

**Part of:** Mandatory Elective Courses

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<td>Mechanical Design IV, tutorial</td>
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**Competence Certificate**

Written examination, consisting of theoretical and constructive part.  
The theoretical examination lasts 1 hour plus reading time.  
The constructional examination takes 3 hours plus reading time.  
Both parts of the examination must be passed in order to pass the overall examination for machine design apprenticeship III+IV.

**Competence Goal**

In mechanical design, students acquire skills in analysis and synthesis using examples (= leading examples). The examples include individual machine elements such as bearings or springs as well as more complex systems such as gears or clutches. After completing the machine design course, the students can apply the learned contents to further technical systems - even those not known from the lecture - by transferring the exemplary learned operating principles and basic functions to other contexts. This enables students to independently analyze unknown technical systems and to synthesize systems suitable for given problems.

**Prerequisites**

None

**Content**

- tolerances and fits  
- component connections  
- gears  
- basics of component dimensioning  
- shaft clutches  
- fundamentals of fluid technology  
- electrical machines
## Workload

### MKL 3:
**Presence:** 45 h  
Attendance time lecture (15 L): 22,5h  
Attendance time exercises (7 exercises): 10,5h  
Attendance time milestones project work (3x 4h): 12h  

**Self-study:** 135h  
Project work in a team: 90h  
Personal preparation and follow-up of lecture and exercise: 45h  

### MKL 4:
**Presence:** 40,5 h  
Attendance lectures (13 L): 19,5h  
Attendance time exercises (6 exercises): 9h  
Attendance time milestones project work (3x 4h): 12h  

**Self-study:** 169,5 h  
Project work in a team: 105h  
Personal preparation and follow-up of lecture and exercise, incl. preparation for the exam: 64,5h  

**Total:** 390 h = 13 LP  

## Learning type
- Lecture
- Tutorial
- Project work during the semester
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

Credits 6
Recurrence Each winter term
Duration 1 term
Language German
Level 3
Version 2

Mandatory
T-CIWVT-101886 Mechanical Processing 6 CR Dittler

Competence Certificate
Success control is a written examination, 120 minutes duration, according to § 4 Abs. 2 No. 1 SPO.

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.

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

Prerequisites
None

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
- Fundamentals of agglomeration
- Fundamentals of storage and conveyance

Recommendation
Courses of 1st - 4th semester

Workload
Lectures and exercises: 56 h
Self-study: 14 h (about one hour per week)
Preparation of examination: 140 h

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
2.36 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

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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 control of success in this module comprises 2 graded major course assessments according to §4 para.2 Nr.3 of the SPO:
1. An oral individual examination with a volume of about 30 minutes for the lecture "22987 Mechanical Separation Technology" and "22988 Exercises to 22987"
2. Project work. Practical collaboration, written report and oral presentation of the results are rated.
The module grade is calculated from the LP-weighted mean of both parts of the module.
Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6).

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 between 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.

Module grade calculation
The module grade is calculated from the LP-weighted mean of both parts of the module.

Prerequisites
Participation requires
- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:
1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

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 appsartuses and machines; apparatus combinations; case studies to solve separation problems.

Recommendation
Modules of 1st - 4th semester
**Workload**
lecture 3SWH, exercises 1SWH, presence time: 60h
self-study: 80h
examination preparation: 80h
project work presence time and self-study: 140h

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

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Competence Certificate
The module comprises two success controls according to § 4(2) No 2,3 SPO:
1. Oral examination of about 25 minutes duration
2. project work
Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6).

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.

Prerequisites
Participation requires

- minimum 60 ECTS
- minimum 1 lab course

Modeled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

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.

Recommendation
Courses of 1st - 4th semester
Workload
360 h

Literature
Scriptum (slides collection), text books:
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
2.38 Module: Module Bachelor Thesis [M-CIWVT-103204]

**Responsible:** Prof. Dr.-Ing. Heike Karbstein
apl. Prof. Dr. Michael Türk

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Bachelor Thesis

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**Competence Goal**
Students are able to work on specialised problems with scientific methods independently and within a defined time frame.

**Prerequisites**
§ 14 (1) SPO

**Modeled Conditions**
The following conditions have to be fulfilled:

1. You need to earn at least 120 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Specialization/ Project Work
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses
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

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

**Competence Certificate**

graded: written examination

**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

**Module grade calculation**

grade of the written examination

**Prerequisites**

none

**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

**Workload**

lectures and exercises: 34h

homework and preparation of examination: 86h

**Literature**


### Module: Particle Technology (CIW-MVMG-02) [M-CIWVT-101141]

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

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#### Competence Certificate
The Module comprises two graded success controls according to § 4 (2) No 2,3 SPO:
1. oral examination, duration 30 minutes (60 %)
2. project work (60 %)

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6).

#### Competence Goal
Students understand 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.

#### Prerequisites
Participation requires
- minimum 60 ECTS
- minimum 1 lab course

#### Modeled Conditions
The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

#### 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.

#### Recommendation
Courses of 1st - 4th semester

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

#### Literature
Skriptum Gas-Partikel-Messtechnik
2.41 Module: Practical Course in Organic Chemistry for Chemical Engineers (CIW-CHEM-03) [M-CHEMBIO-101116]

**Responsible:** Dr. Andreas Rapp

**Organisation:** KIT Department of Chemistry and Biosciences

**Part of:** Laboratories

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**Competence Certificate**

protocols and analytical results

**Competence Goal**

After that course the students should be able to build up a reaction apparatus, to handle hazardous materials and perform chemical reactions. Furthermore the students get an insight in most important purification procedures, e.g. distillation, extraction.

**Module grade calculation**

average out of lab experiments/ analytical results

**Prerequisites**

Compulsory preconditions: written examination OC

**Content**

Key reactions in Organic Chemistry, e.g.: nucleophilic substitution, electrophilic aromatic substitution, carbony compounds, additions to non-activated double bonds

**Workload**

lectures and exercises: 45h  
home work and preparation of examination: 75h

**Literature**

Schwetlick: Organikum, Wiley-VCH
2.42 Module: Process Development and Scale-up (CIW-IKFT-01) [M-CIWVT-101153]

**Responsibility:** Prof. Dr.-Ing. Jörg Sauer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Specialization/Project Work

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**Competence Certificate**

The module comprises two success controls according to § 4 (2) No 2,3 SPO:
- project work/presentation and report
- individual oral examination, duration 30 minutes

The module grade is calculated from the mean of both parts of the module. Additionally Online-Quick-Tests can be done accompanying the lecture. These are included in the oral examination mark with 20%.

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO § 9 (2) - (6).

**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 independent scientific work.

**Module grade calculation**

50% oral examination, 50% 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 earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

**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.
Recommendation
Courses of 1st - 4th semester

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
Belbin, R.M., Management Teams, Why They Succeed or Fail, Routledge, NY, 2013.
Module: Process Machines (CIW-MVMV-04) [M-CIWVT-101139]

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

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Competence Certificate

not graded, passed/not passed
during lab course for each experiment
starting colloquium oral/written, practical work, written report

Competence Goal

The students are able to explain fundamentals of process design for selected process apparatuses and machines. They have the ability to carry out practical experiments to these processes by themselves after advice and according to a manual, to collect experimental data, to describe and to interpret them. They can make easy calculations regarding the design of the examined processes.

Module grade calculation

Non graded

Prerequisites

written exam "organic chemistry" must be passed.

Content

pumps, electroseparator, power input into stirred vessels, heat transfer in and out stirred vessels, refrigerator/heat pump, heat transfer co-current and counter-current, error calculation, emulsification/ice cream machine, flow-characteristics of emulsions, biomass-transport in a screw-reactor

Workload

presence time: 7 experiments, 30 h
preparation and reports: 120 h

Literature

scripts for lecture and manuals for lab course
2.44 Module: Rheology and Product Design (CIW-MVMA-05) [M-CIWVT-101144]

**Responsible:** Dr.-Ing. Claude Oelschlaeger

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Specialization / Project Work

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**Competence Certificate**

The module comprises two grades success controls according to § 4 (2) No 2,3 SPO:
- project work (teamwise)
- oral examinations (courses)

The oral examinations have to be passed as a precondition for project work.

overall grade of the module: average weighted according to the credit points.

1/3 project work
2/3 oral examinations

Each of the course has to be passed ('ausreichend'). A failed course can be repeated one time, according to the SPO § 9 (2) - (6) of SPO.

**Competence Goal**

Basic knowledge about the design of complex fluids based on dispersions or emulsions by chemical engineering processes. Fundamental comprehension of applications and working properties, flow behavior an colloidal stability of disperse systems. Applying this knowledge in context of their project work. They gather experience in teamoriented problem solving.

**Module grade calculation**

final grade = 2/3 x oral examination + 1/3 x 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 earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratoires
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

**Content**

Representation of a systematic of the relation between the quality aspects of products and their physico-chemical properties. Furthermore, these properties are generated in the respective production processes. This systematics is taught in the lecture "Basics of Product Design". In the lecture "Fabrications an characterization of dispersions and emulsions" this systematics is elaborated in a more specific manner. The application of this systematics is practiced on specific case studies.
Workload
lectures and exercises: 135h
homework and preparation of examination: 225h

Literature
Scriptum, articles out of scientific journals, text books:
Lagaly/Schulz/Zimehl: Dispersionen und Emulsionen, Steinkopff (1997),
Barnes/Hutton/Walters: An Introduction to Rheology, Elsevier (1989),
## 2.45 Module: Thermal Process Engineering (CIW-TVT-02) [M-CIWVT-101134]

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### Competence Certificate
Success control is a written examination taking 120 minutes in time according to § 4 Abs. 2 SPO Bachelor Chemical and Process engineering 2015.

### 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 methodological tools adequate. Furthermore, the students can quantitatively apply these tools and skills to processes and problems which are new to them.

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

### Prerequisites
None

### Content
The taught 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.

### Recommendation
Courses of 1st - 4th semester

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

### Literature
personal prints, scientific text books
Module: Thermodynamics I (CIW-TTK-01) [M-CIWVT-101129]

Responsible: Prof. Dr. Sabine Enders
Organisation: KIT Department of Chemical and Process Engineering
Part of: Thermodynamics and Transport Processes

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Competence Certificate
Written examination 120 min
Precondition for participation: 2 of 3 compulsory exercises have to be approved

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.

Module grade calculation
grade of the written examination

Prerequisites
none

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

Recommendation
courses of 1st and 2nd semester

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

Literature
Schaber, K.: Skriptum Thermodynamik I (www.ttk.uni-karlsruhe.de)
Sandler, S. I.: Chemical, Biochemical and Engineering Thermodynamics, J. Wiley & Sons, 2006
Module: Thermodynamics II (CIW-TTK-02) [M-CIWVT-101130]

**Responsible:** Prof. Dr. Sabine Enders

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** Thermodynamics and Transport Processes

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**Competence Certificate**

Written examination 120 min
Precondition for participation: 2 of 3 compulsory exercises have to be approved

**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.

**Module grade calculation**

Grade of the written examination

**Prerequisites**

none

**Content**

Real gases and liquefaction 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.

**Recommendation**

courses of 1st - 3rd semester

Thermodynamics I

**Workload**

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

**Literature**

Aufl., Springer, 2010


Sandler, S. I.: Chemical, Biochemical and Engineering Thermodynamics, J. Wiley & Sons, 2006
### 2.48 Module: Water Quality and Process Engineering of Water and Waste Water Treatment (CIW-WCH-03) [M-CIWVT-101152]

**Responsible:** Prof. Dr. Harald Horn  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** Specialization/ Project Work

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#### Mandatory

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<td>Water Quality and Process Engineering of Water and Waste Water Treatment</td>
<td>8 CR</td>
<td>Abbt-Braun, Horn</td>
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<td>T-CIWVT-103651</td>
<td>Water Quality and Process Engineering of Water and Waste Water Treatment</td>
<td>4 CR</td>
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#### Competence Certificate

There is an oral examination of the lectures and a grading of the project thesis. The overall grade of the module is taken as an average from the individual grades of the oral examination of the lectures and of the project thesis, weighted according to the credit points.

Lectures: overall oral examination of 30 min according to § 4 Abs. 2 No 2 SPO of the lectures "22603 Scientific Principles for Water Quality Assessment" and "22607 Water Quality and Process Engineering of Water and Waste Water Treatment".

Project thesis: individual grades of the written report and the oral presentation, according to § 4 Abs. 2 No. 3 SPO.

Each of the course has to be passed ("ausreichend"). A failed course can be repeated one time, according to the SPO 9 (2) - (6).

#### Competence Goal

The students can explain the basic processes of drinking water supply and waste water treatment. They can describe and apply the basic principles and the criteria for water quality assessment. The can perform calculations, and can evaluate, compare and interprete the data and the results. They are able to use the methodical tools and to analyze the context.

#### Module grade calculation

The overall grade of the module is taken as an average from the individual grades of the oral examination of the lectures and of the project thesis, weighted according to the credit points.

#### Prerequisites

Participation requires

- minimum 60 ECTS
- minimum 1 lab course

#### Modeled Conditions

The following conditions have to be fulfilled:

1. You need to earn at least 60 credits in the following fields:
   - Fundamentals of Scientific Engineering
   - Fundamentals of Mathematics and Natural Sciences
   - Laboratories
   - Thermodynamics and Transport Processes
   - Soft Skill Qualifications
   - Fundamentals of Process Engineering
   - Mandatory Elective Courses

#### Content

Hydrological cycle: different sources and needs, water treatment, water supply, water quality, analytical tools for quality assessment, practical thesis to optimize a treatment step, including experimental lab work, application of different tools for analysis, excursions to drinking water treatment plants and to waste water treatment plants.

#### Recommendation

Courses of 1st - 4th semester
Workload
Attendance time: 60 h
Exam preparation: 60 h
Practical course: 40 h lab, 80 h self-study/report

Literature

- Frimmel (1998): Wasser und Gewässer, Spektrum Verlag, Heidelberg
- Crittenden et al. (2005): Water Treatment, Principles and Design. Wiley & Sons
- Scriptum of the lectures will be available in ILIAS (ILIAS Studierendenportal)
- Script of the lab work
3 Courses

3.1 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-MATH-100280 - Advanced Mathematics I

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**Events**

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

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

**Prerequisites**
A “pass” result on the pre-requisite 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.
### 3.2 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

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**Competence Certificate**

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

**Prerequisites**

A "pass" result on the pre-requisite 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.
### 3.3 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

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| Events | 0131400 | Höhere Mathematik III für die Fachrichtungen Maschinenbau, Chemieingenieurwesen, Verfahrenstechnik, Bioingenieurwesen und das Lehramt Maschinenbau | 4 SWS | Lecture (V) / 🕵️‍♂️ | Griesmaier |

Legend: 🕵️‍♂️ Online, 🟥 Blended (On-Site/Online), 🗂️ On-Site, ☓ Cancelled

**Competence Certificate**

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

**Prerequisites**

A "pass" result on the pre-requisite 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.
3.4 Course: Application of Numerics in Engineering [T-CIWVT-101876]

**Responsible:** Dr. Peter Habisreuther

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101956 - Computational Methods

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**Prerequisites**

Written Examination T-MATH-102250 - Einstieg in die Informatik und algorithmische Mathematik

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course T-MATH-102250 - Introduction to Informatics and Algorithmic Mathematics - Exam must have been started.
3.5 Course: Applied Apparatus Engineering [T-CIWVT-106562]

**Responsible:** Dr. Martin Neuberger  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-103297 - Applied Apparatus Engineering

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

**Competence Certificate**
Learning Control is a written examination, 90 minutes duration.

**Prerequisites**
None

**Responsible:** Dr.-Ing. Benjamin Dietrich  
Dr. Philip Scharfer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-104458 - Applied Thermal Process Engineering

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**Prerequisites**
None
3.7 Course: Applied Thermal Process Engineering - Project work [T-CIWVT-109120]

**Responsible:** Dr.-Ing. Benjamin Dietrich
Dr. Philip Scharfer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-104458 - Applied Thermal Process Engineering

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**Prerequisites**

None
3.8 Course: Bachelor-Thesis [T-CIWVT-106365]

**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-103204 - Module Bachelor Thesis

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

- **Submission deadline**: 4 months  
- **Maximum extension period**: 2 weeks  
- **Correction period**: 6 weeks
**3.9 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

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

**Prerequisites**  
None
3.10 Course: Biotechnology [T-CIWVT-103668]

**Responsible:** Dr. Michael Wörner

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101143 - Biotechnology

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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), ☝ On-Site, ✗ Cancelled

**Prerequisites**

None
3.11 Course: Catalytic Reaction Engineering [T-CIWVT-103653]

**Responsible:** Prof. Dr. Bettina Kraushaar-Czarnetzki

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101140 - Catalytic Reaction Engineering

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<th>2 SWS</th>
<th>Practice (Ü)</th>
<th>Kraushaar-Czarnetzki, und Mitarbeiter</th>
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**Prerequisites**

None
# 3.12 Course: Catalytic Reaction Engineering [T-CIWVT-103652]

**Responsible:** Prof. Dr. Bettina Kraushaar-Czarnetzki  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101140 - Catalytic Reaction Engineering

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*Legend: 📧 Online, 🎤 Blended (On-Site/Online), ⚰️ On-Site, ✗ Cancelled*

**Prerequisites**
None
### 3.13 Course: Cell Biology [T-CIWVT-111062]

**Responsible:** Prof. Dr. Hans-Eric Gottwald  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101624 - Biology for Engineers I

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

**Prerequisites**  
None
3.14 Course: Chemical Process Engineering [T-CIWVT-101884]

**Responsible:** Prof. Dr. Bettina Kraushaar-Czarnetzki

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101133 - Chemical Process Engineering

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**Prerequisites**

None

Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🔴 On-Site, ✗ Cancelled
### 3.15 Course: Control Engineering and System Dynamics [T-MACH-102126]

**Responsible:** Prof. Dr.-Ing. Christoph Stiller  
**Organisation:** KIT Department of Mechanical Engineering  

#### Part of: M-MACH-101300 - Control Engineering and System Dynamics

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#### Events

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<td>Practice groups on control engineering and system dynamics</td>
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**Competence Certificate**  
written exam

**Prerequisites**  
none
3.16 Course: Downstream Processing [T-CIWVT-101897]

**Responsible:** Prof. Dr.-Ing. Jürgen Hubbuch

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101124 - Downstream Processing

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**Prerequisites**

None
3.17 Course: Elementary Physics [T-PHYS-101577]

Responsible: Prof. Dr. Bernd Pilawa  
                Prof. Dr. Alexey Ustinov

Organisation: KIT Department of Physics

Part of: M-PHYS-100993 - Elementary Physics

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Competence Certificate

Written exam (usually about 180 min)
3.18 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

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Legend: 🖥 Online, 🖥 Blended (On-Site/Online), 🗩 On-Site, ✗ Cancelled

**Prerequisites**
None
## 3.19 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
Examination of another type

### Credits
4

### Version
1

### Events
| SS 2020 | 22566 | Projektarbeit im Profilfach Energie- und Umwelttechnik | SWS | Project (PRO) | Trimis, Rauch, Kolb |

### Prerequisites
None
### 3.20 Course: Energy Process Engineering [T-CIWVT-101889]

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

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Legend: 📱 Online, 🧩 Blended (On-Site/Online), ☑ On-Site, ❌ Cancelled

**Prerequisites**

None

**Responsible:** Prof. Dr. Roland Dittmeyer

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101128 - Engineering Mechanics: Dynamics

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Legend: 🖥 Online, 🫖 Blended (On-Site/Online), 🗣 On-Site, ☒ Cancelled

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

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Legend: 🕒 Online, 🌟 Blended (On-Site/Online), 🏠 On-Site, ✗ Cancelled

Prerequisites
None

Modeled Conditions
The following conditions have to be fulfilled:

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

**Responsible:** Dr.-Ing. Bernhard Hochstein
Prof. Dr. Norbert Willenbacher

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-104006 - Engineering Mechanics: Statics and Strength of Materials

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

**Prerequisites**
None

**Responsible:** Dr.-Ing. Bernhard Hochstein
Prof. Dr. Norbert Willenbacher

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-104006 - Engineering Mechanics: Statics and Strength of Materials

**Type**
- Written examination

**Credits**
- 5

**Recurrence**
- Each summer term

**Version**
- 1

**Prerequisites**
None
3.25 Course: Enzyme Technology [T-CIWVT-111094]

**Responsible:** Dr. Jens Rudat  
Prof. Dr. Christoph Syldatk  

**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-105518 - Enzyme Technology

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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.
### 3.26 Course: Ethics and Global Material Cycles [T-CIWVT-101887]

**Responsible:** Prof. Dr. Reinhard Rauch

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101149 - Ethics and Global Material Cycles

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**Events**

| SS 2020 | 22330 | Ethik und Stoffkreisläufe | 2 SWS | Lecture (V) | Hillerbrand, Rauch |

**Prerequisites**

Prerequisite must be passed.

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course T-CIWVT-109219 - Ethics and Global Material Cycles - Prerequisite must have been passed.
3.27 Course: Ethics and Global Material Cycles - Prerequisite [T-CIWVT-109219]

**Responsible:** Prof. Dr. Reinhard Rauch

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101149 - Ethics and Global Material Cycles

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**Prerequisites**

None
3 COURSES

Course: Examination Material Science I & II [T-MACH-105148]

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<tr>
<th>Responsible:</th>
<th>Dr.-Ing. Johannes Schneider</th>
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Part of: M-MACH-102567 - Material Science and Engineering

### Type
Oral examination

### Credits
9

### Recurrence
Each winter term

### Version
1

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Legend: 🚶 Online, ⛽ Blended (On-Site/Online), 🗽 On-Site, ✗ Cancelled

### Competence Certificate
oral; 30 to 40 minutes

No tools and reference tools are allowed!

### Prerequisites
none
### 3.29 Course: Exercises Process Development and Scale-up [T-CIWVT-111005]

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### 3.30 Course: Fluidodynamics, Exam [T-CIWVT-101882]

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

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#### Modeled Conditions

The following conditions have to be fulfilled:

1. The course T-CIWVT-101904 - Fluidodynamics, Tutorial must have been passed.
### 3.31 Course: Fluidodynamics, Tutorial [T-CIWVT-101904]

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

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3.32 Course: Food Biotechnology [T-CIWVT-101898]

Responsible: Prof. Dr.-Ing. Heike Karbstein
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101126 - Food Biotechnology

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

Competence Certificate
This module is successfully completed by a written exam of 120 min (according to § 4 Abs. 2 Nr. 1, SPO Bachelor Bioingenieurwesen 2015)

Prerequisites
The Pre-Condition must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The course T-CIWVT-101899 - Food Biotechnology - Prerequisite must have been passed.
**3.33 Course: Food Biotechnology - Prerequisite [T-CIWVT-101899]**

**Responsible:** Prof. Dr.-Ing. Heike Karbstein  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101126 - Food Biotechnology

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

**Prerequisites**

none
3.34 Course: Food Technology [T-CIWVT-103528]

**Responsible:** Dr.-Ing. Azad Emin

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101148 - Food Technology

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**Legend:** 🖥 Online, Blended (On-Site/Online), 📡 On-Site, ❌ Cancelled

**Competence Certificate**

Die Erfolgskontrolle ist eine mündliche Gruppenprüfung im Umfang von ca. 45 Minuten zu den Inhalten der Lehrveranstaltungen 22230, 22231 und 22232 nach § 4 Abs. 2 Nr. 2 der SPO Bachelor Chemieingenieurwesen und Verfahrenstechnik 2015.

**Prerequisites**

None.
3.35 Course: Food Technology Project Work [T-CIWVT-103529]

**Responsible:** Dr.-Ing. Azad Emin

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101148 - Food Technology

**Type:** Examination of another type

**Credits:** 7

**Version:** 1

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**Prerequisites**

None
### 3.36 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

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3.37 Course: Fundamentals of Refrigeration, oral examination [T-CIWVT-109117]

**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-104457 - Fundamentals of Refrigeration

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Legend: 🖥 Online, 🕒 Blended (On-Site/Online), 🗦 On-Site, ✗ Cancelled

**Competence Certificate**  
Learning Control is an oral examination about the lecture "Grundlagen der Kältetechnik", duration about 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.
### 3.38 Course: Fundamentals of Refrigeration, Project Work [T-CIWVT-109118]

**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-104457 - Fundamentals of Refrigeration

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**Prerequisites**  
None
# 3.39 Course: General and Inorganic Chemistry [T-CHEMBIO-101866]

**Responsible:** Prof. Dr. Mario Ruben  
**Organisation:** KIT Department of Chemistry and Biosciences  
**Part of:** M-CHEMBIO-101117 - General and Inorganic Chemistry

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Legend: ☑ Online, ☑ Blended (On-Site/Online), ☑ On-Site, X Cancelled
3.40 Course: Genetics [T-CIWVT-111063]

**Responsible:** Dr. Katrin Ochsenreither  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101624 - Biology for Engineers I

### Competence Certificate
Written examination with a duration of 90 minutes (section 4 subsection 2 No. 1 SPO).

### Prerequisites
None
### 3.41 Course: Industrial Business Administration [T-WIWI-100796]

**Responsible:** Prof. Dr. Wolf Fichtner  
**Organisation:** KIT Department of Economics and Management  
**Part of:** M-WIWI-100528 - Industrial Business Administration

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**Competence Certificate**

The assessment of this course is an ungraded written examination.

**Prerequisites**

None
3.42 Course: Industrial Microbiology [T-CIWVT-111093]

**Responsible:** Prof. Dr.-Ing. Clemens Posten  
Prof. Dr. Christoph Syldatk

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-105517 - Industrial Microbiology

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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.
3.43 Course: Industrial Organic Chemistry [T-CIWVT-101890]

**Responsible:** Prof. Dr.-Ing. Jürgen Hubbuch
Prof. Dr. Reinhard Rauch
Dr. Michael Wörner

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101137 - Industrial Organic Chemistry

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Legend: 🔄 Online, 🪐 Blended (On-Site/Online), 🗺 On-Site, ✗ Cancelled

**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.
# 3.44 Course: International Concepts of Water Technologies [T-CIWVT-103704]

**Responsible:** Prof. Dr. Andrea Schäfer  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101972 - International Concepts of Water Technologies

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### 3.45 Course: Introduction to Informatics and Algorithmic Mathematics - Exam [T-MATH-102250]

**Responsible:** Prof. Dr. Willy Dörfler  
Dr. rer. nat. Mathias Krause  

**Organisation:** KIT Department of Mathematics  

**Part of:** M-CIWVT-101956 - Computational Methods

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*Legend: 🖥 Online, 🥑 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled*
3.46 Course: Laboratory Work in General and Inorganic Chemistry Part I [T-CHEMBIO-101867]

**Responsible:** Prof. Dr. Helmut Ehrenberg

**Organisation:** KIT Department of Chemistry and Biosciences

**Part of:** M-CIWVT-101964 - Laboratory Work in General and Inorganic Chemistry

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

**Modeled Conditions**
The following conditions have to be fulfilled:

1. The module M-CHEMBIO-101117 - General and Inorganic Chemistry must have been passed.
### 3.47 Course: Laboratory Work in General and Inorganic Chemistry Part II [T-CIWVT-108294]

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**Responsible:** Prof. Dr. Harald Horn  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101964 - Laboratory Work in General and Inorganic Chemistry

**Prerequisites**  
None

**Modeled Conditions**  
The following conditions have to be fulfilled:

1. The module M-CHEMBIO-101117 - General and Inorganic Chemistry must have been passed.  
2. The module M-CIWVT-101138 - Lab Work Process Engineering must not have been started.  
3. The course T-CIWVT-108293 - Safety Instruction must have been passed.
3.48 Course: Laboratory Work Process Engineering [T-CIWVT-108292]

**Responsible:** Dr. Sokratis Sinanis

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101138 - Lab Work Process Engineering

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**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module M-CIWVT-101964 - Laboratory Work in General and Inorganic Chemistry must not have been started.
2. The course T-CHEMBIO-101866 - General and Inorganic Chemistry must have been passed.
3. The course T-CIWVT-108291 - Safety Instruction must have been passed.
3.49 Course: Laboratory Work Process Machines [T-CIWVT-101903]

Responsible: Dr.-Ing. Marco Gleiß
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101139 - Process Machines

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Prerequisites
Written Exam "Organic Chemistry" must be passed.

Modeled Conditions
The following conditions have to be fulfilled:

1. The module M-CHEMBIO-101115 - Organic Chemistry for Engineers must have been passed.
2. The module M-CHEMBIO-101116 - Practical Course in Organic Chemistry for Chemical Engineers must not have been started.
### 3.50 Course: Laboratory Work: Downstream Processing [T-CIWVT-111097]

**Responsible:** Prof. Dr.-Ing. Jürgen Hubbuch  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101124 - Downstream Processing

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**Prerequisites**
None.
3.51 Course: Mechanical Design Basics I and II [T-MACH-110363]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** M-MACH-101299 - Mechanical Design

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**Competence Certificate**  
Written Exam (90min) on the topics of MKLGI and MKLGII.

**Prerequisites**  

**Modeled Conditions**  
The following conditions have to be fulfilled:

1. The course T-MACH-110364 - Mechanical Design Basics I, Tutorial must have been passed.
2. The course T-MACH-110365 - Mechanical Design Basics II, Tutorial must have been passed.
### 3.52 Course: Mechanical Design Basics I, Tutorial [T-MACH-110364]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** M-MACH-101299 - Mechanical Design

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

#### Competence Certificate

To pass the preliminary work, attendance at 3 workshop sessions of the MKL1 transmission workshop and the passing of a colloquium at the beginning of each workshop are prerequisites.

#### Prerequisites

None
### 3.53 Course: Mechanical Design Basics II, Tutorial [T-MACH-110365]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** M-MACH-101299 - Mechanical Design

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**Competence Certificate**  
CIW/ VT/ IP-M/ WiING / NWT/ MATH/ MWT: For passing the prerequisite it is necessary that a design task is successfully completed as a technical hand drawing  
MIT: To pass the preliminary examination, attendance at workshop sessions and a colloquium at the beginning of each workshop are required.

**Prerequisites**  
None
### 3.54 Course: Mechanical Design III & IV [T-MACH-104810]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering

**Part of:** M-MACH-102829 - Mechanical Design III+IV

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

**Competence Certificate**

written exam consisting of:

- written part duration 60 min and
- design part duration 180 min

Sum: 240 min

**Prerequisites**

Admission to the exam only with successful completion of the Mechanical Design III, Tutorial and Mechanical Design IV, Tutorial.

**Modeled Conditions**

You have to fulfill one of 2 conditions:

1. The course T-MACH-110955 - Mechanical Design III, Tutorial must have been passed.
2. The course T-MACH-110956 - Mechanical Design IV, tutorial must have been passed.
### 3.55 Course: Mechanical Design III, Tutorial [T-MACH-110955]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** M-MACH-102829 - Mechanical Design III+IV

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Legend: 📚 Online, 🤞 Blended (On-Site/Online), ⚠️ On-Site, ✗ Cancelled

#### Competence Certificate

Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single CAD-workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

#### Prerequisites

None
### Course: Mechanical Design IV, tutorial [T-MACH-110956]

**Responsible:** Prof. Dr.-Ing. Sven Matthiesen  
**Organisation:** KIT Department of Mechanical Engineering  
**Part of:** M-MACH-102829 - Mechanical Design III+IV

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#### Competence Certificate
Concomitant to the lecture, a workshop with 3 workshop sessions takes place over the semester. During the workshop the students are divided into groups and their mechanical design knowledge will be tested during a colloquium at the beginning of every single workshop session. The attendance is mandatory and will be controlled. The pass of the colloquia and the process of the workshop task are required for the successful participation.

#### Prerequisites
None
3.57 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

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Prerequisites

none
### 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

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

#### Prerequisites

None
3.59 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

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**Prerequisites**
none
3.60 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

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| Events | SS 2020 | 22138 | Projektarbeit im Profilfach Mikroverfahrenstechnik | 2 SWS | Practice (Ü) | Pfeifer, und Mitarbeiter |

Competence Certificate
Die Erfolgskontrolle ist eine Prüfungsleistung anderer Art (Projektarbeit) nach § 4 Abs. 2 Nr. 3 der SPO Bachelor Chemieingenieurwesen und Verfahrenstechnik 2015. Es werden die praktische Mitarbeit, der schriftliche Bericht sowie die mündliche Präsentation der Ergebnisse individuell bewertet.

Prerequisites
None
### 3.61 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

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**Competence Certificate**

Die Erfolgskontrolle ist eine mündliche Einzelprüfung nach § 4 Abs. 2 Nr. 2 der SPO Bachelor Chemieingenieurwesen und Verfahrenstechnik 2015 im Umfang von ca. 25 Minuten zu Lehrveranstaltung "Auslegung von Mikroreaktoren".

**Prerequisites**

None
### 3.62 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

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**Prerequisites**  
acc. to module catalogue
3.63 Course: Particle Technology [T-CIWVT-103654]

**Responsible:** Prof. Dr.-Ing. Achim Dittler

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101141 - Particle Technology

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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗑 On-Site, ✗ Cancelled

**Prerequisites**

None
### 3.64 Course: Particle Technology [T-CIWVT-103655]

**Responsible:** Prof. Dr.-Ing. Achim Dittler  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101141 - Particle Technology

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**Prerequisites**  
None
3.65 Course: Practical Course in Organic Chemistry for Chemical Engineers [T-CHEMBIO-101868]

**Responsible:** Dr. Andreas Rapp  
**Organisation:** KIT Department of Chemistry and Biosciences  
**Part of:** M-CHEMBIO-101116 - Practical Course in Organic Chemistry for Chemical Engineers

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Organisch-Chemisches Praktikum für Studierende des Chemie- und Bioingenieurwesens  
SWS  
Practical course (P) / 🗣  
Mitarbeiter, Rapp, Meier

**Modeled Conditions**

The following conditions have to be fulfilled:

1. The module M-CHEMBIO-101115 - Organic Chemistry for Engineers must have been passed.
3.66 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

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<td>Prozesssentwicklung und Scale-up</td>
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<td>Lecture (V) / 🗣️</td>
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**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.
3.67 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
Examination of another type

### Credits
4

### Recurrence
Each summer term

### Version
1

#### Events

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#### Prerequisites
none
### Course: Rheology and Product Design [T-CIWVT-103522]

**Responsible:** Dr.-Ing. Claude Oelschlaeger  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101144 - Rheology and Product Design

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<td>Rheometrie und Rheologie</td>
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<td>22816</td>
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<td>Herstellung und Charakterisierung von Suspensionen und Emulsionen</td>
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<td>Lecture (V) / On-Site</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ❌ Cancelled

**Prerequisites**  
None
### 3.69 Course: Rheology and Product Design Project Work [T-CIWWT-103524]

**Responsible:** Dr.-Ing. Claude Oelschlaeger  
**Organisation:** KIT Department of Chemical and Process Engineering  
**Part of:** M-CIWVT-101144 - Rheology and Product Design

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**Modeled Conditions**

The following conditions have to be fulfilled:

1. The course T-CIWWT-103522 - Rheology and Product Design must have been passed.
3.70 Course: Safety Instruction [T-CIWVT-108293]

**Responsible:** Dr. Gudrun Abbt-Braun

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101964 - Laboratory Work in General and Inorganic Chemistry

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**Prerequisites**

None
3.71 Course: Safety Instruction [T-CIWVT-108291]

Responsible: Dr. Sokratis Sinanis
Organisation: KIT Department of Chemical and Process Engineering
Part of: M-CIWVT-101138 - Lab Work Process Engineering

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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

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<td>Thermische Verfahrenstechnik</td>
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<td>22806</td>
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Legend: 🔄 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled
3.73 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

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<td>22002</td>
<td>Thermodynamics I</td>
<td>3 SWS</td>
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<td>WS 20/21</td>
<td>22003</td>
<td>Thermodynamics I - exercises</td>
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**Legend:** 🖥 Online, 🧩 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Modeled Conditions**  
The following conditions have to be fulfilled:  
1. The course T-CIWVT-101878 - Thermodynamics I, Tutorial must have been passed.
### 3.74 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

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<td>Tutorial thermodynamics I and II</td>
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Legend: 🖥 Online, 🧩 Blended (On-Site/Online), ☆ On-Site, ❌ Cancelled

**Prerequisites**  
None
### 3.75 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
- Written examination  
- Credits: 7  
- Version: 1

#### Events

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<td>22005</td>
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<td>2 SWS</td>
<td>Practice (Ü)</td>
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<td>Tutorium Thermodynamik II</td>
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#### 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.*
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

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**Prerequisites**

None
3.77 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-MATH-100280 - Advanced Mathematics I

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Legend:  
🖥 Online, 🍃 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Learning assessment is carried out by written assignments (pre-requsite). Exact requirements will be communicated in the lectures.

**Prerequisites**

None.
3.78 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

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**Competence Certificate**

Learning assessment is carried out by written assignments (pre-requisite). Exact requirements will be communicated in the lectures.

**Prerequisites**

None.
**3.79 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

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Legend: 🚫 Online, ☘ Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Learning assessment is carried out by written assignments (pre-requisit). Exact requirements will be communicated in the lectures.

**Prerequisites**

None.
# 3.80 Course: Water Quality and Process Engineering of Water and Waste Water Treatment [T-CIWVT-103651]

**Responsible:** Dr. Andrea Hille-Reichel  
Prof. Dr. Harald Horn  

**Organisation:** KIT Department of Chemical and Process Engineering  

**Part of:** M-CIWVT-101152 - Water Quality and Process Engineering of Water and Waste Water Treatment

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**Events**

| SS 2020 | 22643 | **Project Work in Subject "Water, Technology and Environment"** | 2 SWS | Project (PRO) | Horn, und Mitarbeiter |

**Competence Certificate**

Project thesis: individual grades of the written report and the oral presentation.  
(According to § 4 Abs. 2 Nr. 3 SPO Bachelor Bioingeneering 2015)

**Prerequisites**

None

**Responsible:** Dr. Gudrun Abbt-Braun
Prof. Dr. Harald Horn

**Organisation:** KIT Department of Chemical and Process Engineering

**Part of:** M-CIWVT-101152 - Water Quality and Process Engineering of Water and Waste Water Treatment

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Legend: 📚 Online, 📚 Blended (On-Site/Online), 🗣 On-Site, ✗ Cancelled

**Competence Certificate**

Success control is an overall oral examination of about 30 min according to § 4 Abs. 2 der SPO Bachelor Bioingenieurwesen 2015 of the lectures "22603 Scientific Principles for Water Quality Assessment" and "22607 Water Quality and Process Engineering of Water and Waste Water Treatment".

**Prerequisites**

None