

Module Handbook

TUK MODHB Homepage

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

Die hier dargestellten veröffentlichten Studiengang-, Modul- und Kursdaten des Fachbereichs Maschinenbau und Verfahrenstechnik ersetzen die Modulbeschreibungen im KIS und wurden mit Ausnahme folgender Studiengänge am 28.10.2020, bzw. am 13.01.2021 verabschiedet.

Ausnahmen:

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

Module MV-MVT-41-M-4

Design and Operation of Chemical Apparatus (M, 3.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-MVT-41-M-4	<i>Design and Operation of Chemical Apparatus</i>	3.0 CP (90 h)

Basedata

CP, Effort	3.0 CP = 90 h
Position of the semester	1 Sem. in SuSe
Level	[4] Bachelor (Specialization)
Language	[DE] German
Module Manager	Nikolaus, Kai, Dr.-Ing. (WMA DEPT: MV)
Lecturers	Nikolaus, Kai, Dr.-Ing. (WMA DEPT: MV)
Area of study	[MV-MVT] Particle Process Engineering
Reference course of study	[MV-82.A29-SG] B.Sc. Biological and Chemical Engineering
Lifecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V+1U	MV-MVT-86453-K-4	P	-	PL1	3.0	SuSe

- About [MV-MVT-86453-K-4]: Title: "Design and Operation of Chemical Apparatus"; Presence-Time: 42 h; Self-Study: 48 h

Examination achievement PL1

- Form of examination: **written exam (Klausur) (90 Min.)**
- Examination Frequency: each semester
- Examination number: 10453 ("Design and Operation of Chemical Apparatus")

Evaluation of grades

The grade of the module examination is also the module grade.

Contents

From [MV-MVT-86453-K-4] Design and Operation of Chemical Apparatus:

Typical requirements and tasks that chemical apparatuses have to meet are presented and associated solutions are shown. The following topics are covered:

- Legal basis of plant construction (Pressure Equipment Directive 2014/68/EU, Explosion Protection Directive 2014/34/EU, Machinery Directive 2006/42/EC, EU regulations on hygienic design, European standards)
- Functions and types of industrial apparatus in the various areas of process engineering (mechanical, thermal, chemical and bioprocess engineering)
- Apparatus materials (ferrous materials, non-ferrous materials, non-metals)
- Process flow diagrams
- Pipeline elements, apparatus elements and fittings
- Basics for the strength calculation of apparatus and pipeline elements under static and dynamic stresses as well as thermal stresses
- Design of apparatuses and pipelines according to DIN EN 13445, DIN EN 13480 and AD 2000
- Support and expansion compensation of pipelines

- Total stress on pipelines (elasticity analysis according to DIN EN 13480)
- Flow-optimized design of pipelines (pressure loss)
- Basics for cleaning, disinfection and sterilization of apparatus in pharmaceutical and food processing plants
- Construction principles for the hygienic design of apparatus in pharmaceutical and food processing plants

Competencies / intended learning achievements

From [MV-MVT-86453-K-4] Design and Operation of Chemical Apparatus:

1. Lecture

The students are able to

- classify the applicable legal principles in the construction of process plants
- name the elements of apparatus and pipeline technology
- explain the basics of dimensioning of apparatus and pipelines
- explain the basics of the calculation of spans of pipe laying and the design of expansion compensation systems
- select the appropriate material(s)
- construct apparatus for the requirements of the pharmaceutical industry, food and biotechnology and fine chemistry according to the rules of hygienic design
- plan cleaning, disinfection and sterilization steps
- analyze the combination of requirements and propose solutions

2. Exercise

Students are able to

- design elements of apparatus and pipelines according to DIN EN 13445, DIN EN 13480 and AD 2000 for static and thermal stress
- calculate the span when laying pipes
- determine the length and arrangement of bending legs to compensate for expansion in pipelines
- determine the pressure loss in a pipeline
- estimate the operating conditions for the disinfection and sterilization of process plants (medium, temperature, working time, etc.)

Literature

From [MV-MVT-86453-K-4] Design and Operation of Chemical Apparatus:

- DIN EN 13445, DIN EN 13480, Beuth Verlag
- AD 2000 Regelwerk, Beuth Verlag
- Wagner, Walter: Festigkeitsberechnungen im Apparate- und Rohrleitungsbau, Vogel Verlag, 2012
- Herz, Rolf: Grundlagen der Rohrleitungs- und Apparatechnik, Vulkan Verlag, 2014

Requirements for attendance of the module (informal)

Recommended:

Modules:

- [MV-SAM-24-M-4] Fluid Mechanics I (M, 5.0 LP)
- [MV-TM-54-M-4] Elements of Applied Mechanics I (M, 6.0 LP)
- [MV-WKK-B100-M-4] Materials Science (M, 11.0 LP)

Requirements for attendance of the module (formal)

None

References to Module / Module Number [MV-MVT-41-M-4]

Course of Study**Section****Choice/Obligation**

[MV-82.A29-SG] B.Sc. Biological and Chemical Engineering

[Fundamentals]
Ingenieurwissenschaftliche
Grundlagen

[P] Compulsory