TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

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 wuden 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-WKK-196-M-4

High Temperature Materials (M, 3.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-WKK-196-M-4	*High Temperature Materials*	3.0 CP (90 h)

Basedata

CP, Effort	3.0 CP = 90 h
Position of the semester	1 Sem. in WiSe
Level	[4] Bachelor (Specialization)
Language	[DE] German
Module Manager	Beck, Tilmann, Prof. Dr.-Ing. (PROF | DEPT: MV)
Lecturers	Beck, Tilmann, Prof. Dr.-Ing. (PROF | DEPT: MV)
Area of study	[MV-WKK] Materials Science and Engineering
Reference course of study	[MV-88.B78-SG] M.Sc. Production Engineering in Mechanical Engineering
Livecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V	**MV-WKK-86157-K-4**	P	-	PL1	3.0	WiSe

- About **[MV-WKK-86157-K-4]**: Title: "High Temperature Materials"; Presence-Time: 28 h; Self-Study: 62 h

Examination achievement PL1

- Form of examination: **written or oral examination**
- Examination Frequency: each semester
- Examination number: 10163 ("High Temperature Materials")

> Written (90 minutes) or oral (25 - 35 minutes) examination

Evaluation of grades

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

Contents

From [MV-WKK-86157-K-4] High Temperature Materials:

High-temperature components in gas turbines for power plants and aircraft engines as well as in modern steam turbine systems are subject to high mechanical stresses at temperatures that can reach up to 90% of the melting point of the materials used. In-depth knowledge of the loadings that occur and the properties of typical high-temperature materials, i.e., nickel and cobalt-based alloys, high-temperature steels and ceramic thermal barrier coating systems, is therefore essential for the safe design of such components.

The lecture first gives an overview of the requirements for materials in modern high-temperature components and discusses the essential loading types (creep loading, high-temperature fatigue, high-temperature corrosion, thermomechanical fatigue). The most important high-temperature materials, i.e., heat resistant steels, Ni-base alloys, Co-base alloys and thermal barrier coating systems, are then presented, with a focus on a sound understanding of the relationships between material composition, microstructure and application relevant properties.

Competencies / intended learning achievements

From [MV-WKK-86157-K-4] High Temperature Materials:

The students are able:

- on the level of subject matter expertise:
  - to describe the essential thermal and mechanical as well as corrosive loadings in high-temperature components of gas and steam turbines
  - to explain the transfer of such component loads to laboratory tests on material samples
  - to explain the essential microstructural deformation and damage mechanisms under high temperature loadings
- on the level of methodological expertise:
  - to derive the essential measures to enable steels, nickel and cobalt-based alloys for high temperature application
  - to apply this knowledge of the correlation of alloy, microstructure and properties to the material selection for high-temperature components

Literature

From [MV-WKK-86157-K-4] High Temperature Materials:

- Bürgel, Maier, Niendorf: Handbuch Hochtemperatur-Werkstofftechnik, Vieweg, Braunschweig

Requirements for attendance of the module (informal)

Recommended:

Modules:

- [MV-WKK-103-M-7] Construction Materials II (M, 3.0 LP)
- [MV-WKK-39-M-4] Construction Materials I (M, 3.0 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-WKK-196-M-4]

Course of Study	Section	Choice/Obligation
[MV-88.B73-SG] M.Sc. Materials Science and Engineering	[Compulsory Modules] Pflichtmodule	[P] Compulsory

Module-Pool	Name
[MV-ALLG-2022-MPOOL-6]	Wahlpflichtmodule Master allgemein 2022
[MV-ALL-MPOOL-6]	Wahlpflichtmodule allgemein
[MV-EVT-2022-MPOOL-4]	Wahlpflichtmodule B.Sc. EVT 2022
[MV-EVT-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. EVT 2022
[MV-EVT-MPOOL-6]	Wahlplichtmodule Energie- und Verfahrenstechnik
[MV-MatWerk-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Materialwissenschaften und Werkstofftechnik 2022
[MV-PE-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Produktentwicklung 2022
[MV-PE-MPOOL-6]	Wahlpflichtmodule Produktentwicklung im Maschinenbau
[MV-PT-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Produktionstechnik 2022
[MV-PT-MPOOL-6]	Wahlpflichtmodule Produktionstechnik