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-TM-M142-M-7

Non-linear Continuum Mechanics (M, 3.0 LP)

Module Identification

Module Number	Module Name	CP (Effort)
MV-TM-M142-M-7	*Non-linear Continuum Mechanics*	3.0 CP (90 h)

Basedata

CP, Effort	3.0 CP = 90 h
Position of the semester	1 Sem. in SuSe
Level	[7] Master (Advanced)
Language	[DE] German
Module Manager	Müller, Ralf, Prof. Dr.-Ing. (PROF | DEPT: MV)
Lecturers	Müller, Ralf, Prof. Dr.-Ing. (PROF | DEPT: MV) Sator, Christian, Dr.-Ing. (WMA | DEPT: MV) Schlüter, Alexander, Dr.-Ing. (WMA | DEPT: MV)
Area of study	[MV-LTM] Applied Mechanics
Reference course of study	[MV-88.808-SG] M.Sc. Computational Engineering
Livecycle-State	[NORM] Active

Courses

Type/SWS	Course Number	Choice in Module-Part	SL	PL	CP	Sem.
2V	**MV-TM-86006-K-7**	P	-	PL1	3.0	SuSe

- About **[MV-TM-86006-K-7]**: Title: "Non-linear Continuum Mechanics"; Presence-Time: 28 h; Self-Study: 62 h

Examination achievement PL1

- Form of examination: **oral examination (30-45 Min.)**
- Examination Frequency: each semester
- Examination number: 10007 ("Non-linear Continuum Mechanics")

Evaluation of grades

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

Contents

From [MV-TM-86006-K-7] Non-linear Continuum Mechanics:

Kinematics

- Deformation
- Time-derivatives
- Strain
- Objectivity

Balance laws

- Reynold's theorem
- General form of a balance law
- Balance of mass
- Balance of linear momentum

- Balance of angular momentum
- Balance of energy and entropy
- Second law of thermodynamics

Constitutive Laws

- General form
- Simplifications
- Thermo-elastic and hyperelastic materials
- Fluids

Competencies / intended learning achievements

From [MV-TM-86006-K-7] Non-linear Continuum Mechanics:

- Students are familiar with tensor calculus
- Students are able to explain the kinematics of finite deformations
- Students know fundamental kinematic quantities and can interpret them
- Students understand the concept of objectivity
- Students know the basic balance laws, their implications and the difference between their local and global forms
- Students understand the need for and the character of material laws
- Students are familiar with typical material laws and their implications

Literature

From [MV-TM-86006-K-7] Non-linear Continuum Mechanics:

- W. Becker, D. Gross; Mechanik elastischer Körper und Strukturen; Springer Berlin; ISBN: 3-540-43511-5
- R. Kienzler, R. Schröder; Einführung in die Höhere Festigkeitslehre; Springer Berlin; ISBN: 3-540-89324-5
- L. E. Malvern; Introduction to the Mechanics of a Continuous Medium; Prentice Hall; ISBN: 0-134-87603-0
- R. W. Ogden; Non-Linear Elastic Deformations; Dover Pubn Inc; ISBN-10: 0-486-69648-0
- P. Haupt; Continuum Mechanics and Theory of Materials; Springer Berlin; ISBN: 3-540-43111-X
- R. Greve; Kontinuumsmechanik: Ein Grundkurs für Ingenieure und Physiker; Springer; ISBN: 3-540-00760-1
- Y. C. Fung, P. Tong; Classical and Computational Solid Mechanics; World Scientific Publishing Company; ISBN-10: 9-810-24124-0
- G. A. Holzapfel; Nonlinear Solid Mechanics: A Continuum Approach for Engineering; Wiley; ISBN-10: 0-471-82319-8
- Altenbach, H. Altenbach; Einführung in die Kontinuumsmechanik; Teubner Studeinbücher Mechanik; ISBN: 3-519-03096-9
- A.J.M. Spencer; Continuum Mechanics; Dover New York; ISBN 0-486-43594-6
- M.E. Gurtin; An Introduction to Continuum Mechanics; Academic Press San Diego; ISBN: 0-12-309750-9
- I-S. Liu; Continuum Mechanics; Springer Berlin; ISBN: 3-540-43019-9

Requirements for attendance of the module (informal)

Applied Mechanics, Mathematics

Requirements for attendance of the module (formal)

None

References to Module / Module Number [MV-TM-M142-M-7]

Module-Pool	Name
[MV-ALLG-2022-MPOOL-6]	Wahlpflichtmodule Master allgemein 2022
[MV-ALL-MPOOL-6]	Wahlpflichtmodule allgemein
[MV-CE-2022-MPOOL-6]	Wahlpflichtmodule M.Sc. Computational Engineering 2022
[MV-CE-MPOOL-6]	Wahlpflichtmodule Computational Engineering