TUBAF
Die Ressourcenuniversität.
Seit 1765.

INTERNATIONAL MASTER‘S PROGRAM
COMPUTATIONAL MATERIALS SCIENCE

Orientation Meeting Winter Term 2025/2026

Prof. Dr.-Ing. habil Bernhard Eidel
Dean of Studies, Chair of Micromechanical Materials Modelling
16.10.2025

Freiberg

From Wikipedia, the free encyclopedia Coordinates: 50°54′43″N 13°20′34″E

For the town in Baden-Württemberg, see Freiberg am Neckar.

For other uses, see Freiberg (disambiguation).

Not to be confused with Freiburg.

NOUN der Berg | die Berge
SYNO Berg | Höhe | [kleiner] Berg ... ⊞

Berg-
mountain {adj} [attr.]

Berg {m}
mountain
mount <Mt.> geogr.
berg [S.Afr.]

NOUN die Burg | die Burgen
SYNO Burg | Festung | Kastell

Burg-
castle {adj} [attr.] [referring to a fortified castle, typically of the medieval period]

Burg {f}
castle [fortified, esp. of the medieval period] archi. hist.
fortress archi. hist. mil.
holdfast [castle, fortress, tower] games

Freiberg

From Wikipedia, the free encyclopedia Coordinates: 50°54′43″N 13°20′34″E

Freiberg is a university and former mining town in the Free State of Saxony, Germany. It is a so-called *Große Kreisstadt* (large county town) and the administrative centre of Mittelsachsen district.

Its historic town centre has been placed under heritage conservation and is a chosen site for the proposed UNESCO World Heritage Site known as the Ore Mountain Mining Region. Until 1969, the town was dominated for around 800 years by the mining and smelting industries. In recent decades it has restructured into a high technology site in the fields of semiconductor manufacture and solar technology, part of Silicon Saxony. It is home of the oldest university of mining and metallurgy in the world - the Freiberg University of Mining and Technology.

Geography

- lies in the northern foothills of the Ore Mountains
- altitude of about 412 m above NHN
- about 31 km west-southwest of Dresden, 31 km east-northeast of Chemnitz, about 82 km southeast of Leipzig, and about 179 km south of Berlin and about 120 km northwest of Prague
- close to the Czech boarder (you can even go by bike to Prague!)

A brief history of TU Bergakademie Freiberg

1180: Discovery of Silver Ore in the Freiberg Region

1765: **Foundation of Bergakademie**

1771: First foreign student (Albert Vergeel from Holland; Matr.-Nr. 77)

1791-93: Alexander von Humboldt studied in Freiberg (scientist and adventurer)

1857-59: Clemens A. Winkler studied in Freiberg (chemist, discovered Element Germanium)

1863: Element Indium discovered by Ferdinand Reich and Theodor Richter in Freiberg

1989-93: Re-establishment as Technical University

1991: First international Master course at TU: “International Management of Resources and Environment” (IMRE)

2009: first year ever with >5000 students

Mining Universities around the World

Colorado School of Mines

Ecole de Mines

Montanuniversität Leoben

KU Leuven

The University today

- 6 Faculties - you are at the **Faculty 4, Faculty of Mechanical, Process and Energy Engineering**
- 42 institutes

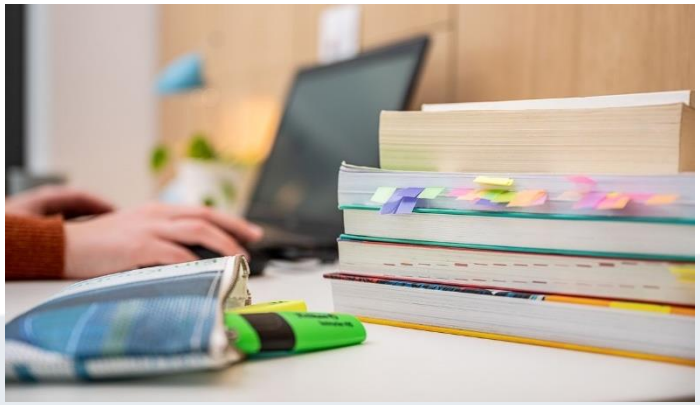
- ~ 4300 students; (~ 59% international students); 35 % female
- 90 professors

- 66 degree programs
- 36 Master courses (12 international Masters)
- Double-degree aggreements with partner universities

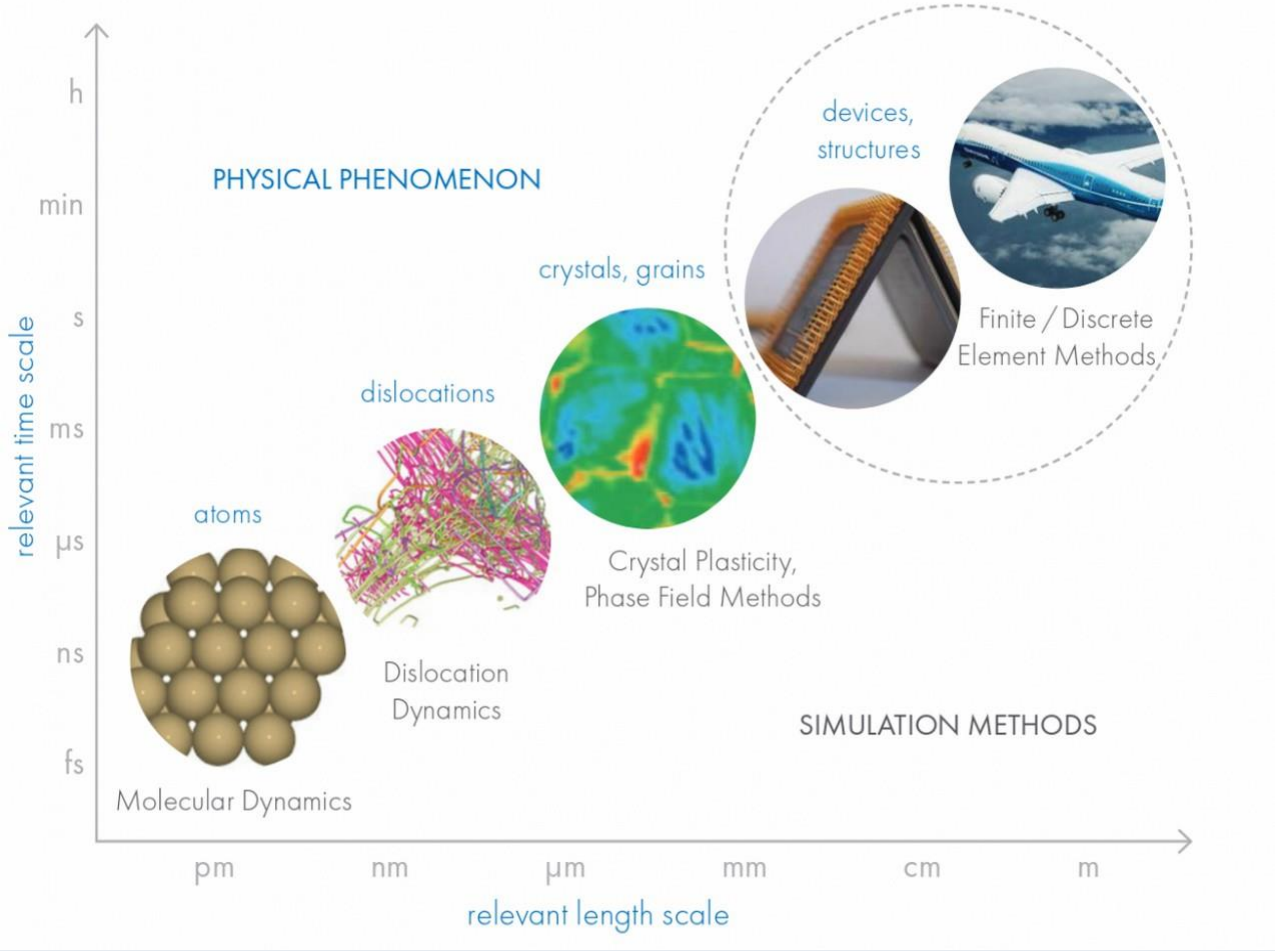
- no tuition fees

- Research project funding ~ 64 Mio. €/ year

- 184 active cooperation agreements, including 76 ERASMUS agreements

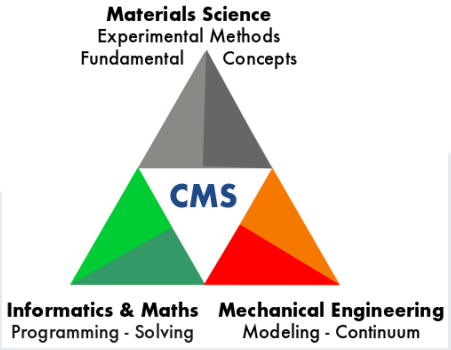


Relevant Length-Scales (Experimental Observation/Modeling)



Focus Areas of CMS

- Strengthen knowledge in Materials Science
  - material behavior
  - experimental methods
- Develop Scientific Programming Skills
  - scripting, coding, OO, HPC
  - numerically solving ODEs and PDEs
  - data analysis and data visualization
- Refresh and extend knowledge in (theoretical) solid mechanics
  - thermodynamics, continuum mechanics
  - constitutive modelling
- Become a power user of modern computational tools
  - chosen simulation methods
  - data analysis and visualization
- Deep understanding of most commonly used simulation methods



Program structure and elements of the Master Program

Duration: 4 Semester (120 credit points – Europians System)

- **1. semester =** 15 weeks lectures (**20.10.25 – 29.12.25 and 05.01.26 – 13.02.26**) + 5 weeks examination time (**16.02.2026 - 20.03.2026**) + 2 weeks for internship or holiday

- **class schedule** - for each semester**; search „course catalog“**

- **modul** - consists lectures and exercises, seminars and/ or lab

- **exames** - for each module; registration in self service (**24.11.2025 - 11.12.2025**)
  - in case of failure: repeat within 1 year;
  KA written exame; **MP** oral exame

- **4. Semester** - Master Thesis (duration 6 months) with presentation and defence

CMS Curriculum

120 CP = 103 CP Mandatory subjects + 17 CP Electives (13 CP Core electives + 4 CP Free electives)

Semester 1		Semester 2		Semester 3		Semester 4	
Mandatory Modules	CPs	Mandatory Modules	CPs	Mandatory Modules	CPs	Mandatory Modules	CPs
Software Tools for Computational Materials Science	5	Selected Topics of Solid State Physics	4	Introduction to High Performance Computing and Optimization	4	Master Thesis	30
Introduction to Scientific Programming	4	AI-Assisted Programming in Computational Materials and Mechanics	5	Experimental Methods of Structure Characterization of Matters	4		
Numerical Analysis of Differential Equations	4	Theory, Modelling and Simulation of Microstructures	5	Personal Programming Project	12		
Thermodynamics of Materials	4	Continuum Mechanics	4	Elective modules	CPs		
Microstructures and Mechanics of Materials	10	Nonlinear Finite Element Methods	4	Plasticity	4		
Deutsch A1.1/A2.1/B1.1/B2.1	4	Elective modules	CPs	Atomistic Simulation Methods	4		
		Materials Science and Mechanical Properties of Metals	7	Discrete Element Method	4		
		Crystal Plasticity, Texture and Anisotropy	4	Fracture Mechanics Computations	5		
		Machine Learning for Material Scientists	4	Micromechanics and Homogenization Principles	4		
		Parameter Identification in Nonlinear Solid Mechanics	4	Semiconductors	3		
				Ceramic Engineering	4		
				Stochastic Methods for Materials Science	4		

**CPs – ECTS Credit Points*

Program structure
How to read the course schedule – your 1st semester

Modul	1.Sem V/Ü/S/P	2.Sem V/Ü/S/P	3.Sem V/Ü/S/P	4.Sem V/Ü/S/P	CP
Introduction to Scientific Programming	2/0/0/2				**4**
Software Tools for Computational Materials Scientists	2/2/0/0				**5**
Deutsch A1/1. Semester	0/4/0/0				**4**
Numerical Analysis of Differential Equations	2/1/0/0				**4**
Thermodynamics of Materials	2/0/1/0				**4**
Microstructures and Mechanics of Materials	4/4/0/0				**10**

V – Vorlesung - lecture;
Ü – Übung - exercise;

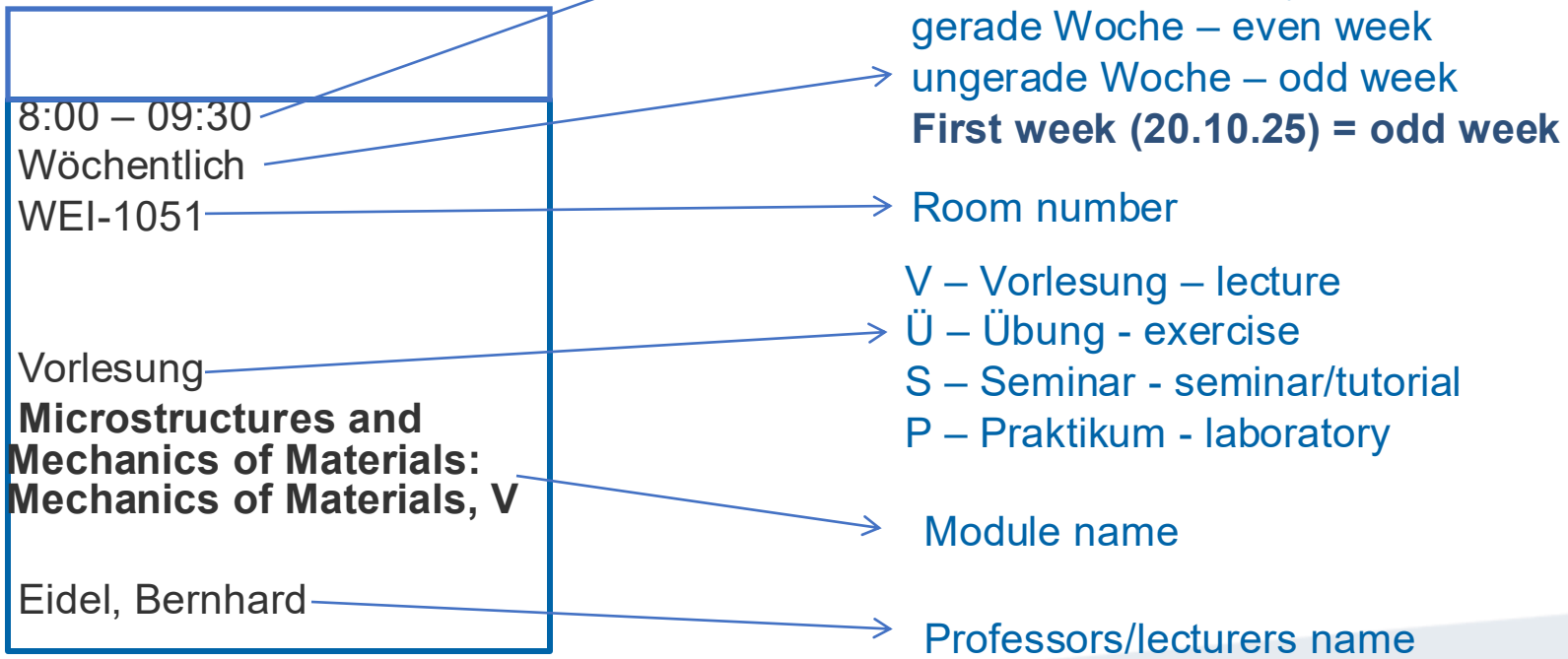
S – Seminar - seminar;

P – Praktikum - lab
CP – Leistungspunkte - credit points

Advisable CP: 30 CP‘s / semester
Advisable SWS : ~ 24 hours/week

Program Structure: Your class schedule for winter semester 2025/2026

How to read the schedule



Study program
German language courses

For beginners:

Deutsch A1/1	winter term	mandatory
Deutsch A1/2	summer term	optional

For students who came with A1:

Deutsch A2/1	winter term	mandatory
Deutsch A2/2	summer term	optional

For students who came with A2:

Deutsch B1/1	winter term	mandatory
Deutsch B1/2	summer term	optional

Online Registration for the courses is mandatory!

Exams / Prüfungen

- take place after lectures and exercises are completed

- **Beginning of November the examination plan for winter term will be published**
  (Internet; Self Service, Black Wall in the Faculty/Institute)

- **Registration for each exam is mandatory** (online; self service)
  (WiSe 2025/26: 24.11.2025 - 11.12.2025)

- **in case of non-attendance after registration – Mark 5/failure**
  de-registration is possible (at the latest 1 week before the exam date in self service portal)
(exception: Personal Progamming Project PPP)

- **first repeat** – within one academic year
- **supplementary oral examination to the first repeat examination** - until the start of the registration period of the next examination period
- **second repeat** - at the next examination session
  - After that, there is no further re-take! The candidate is exmatriculated.

- **Examination period winter semester: 16.02.2026 (Mo) - 20.03.2026 (Fr)**

Module Description (in Module Database)

Data:	KOTM. MA. Nr. 3120 / Examination number: 41907	Version: 18.05.2017	Start Year: SoSe 2018
Module Name:	**Continuum Mechanics**		
(English):			
Responsible:	Kiefer, Björn / Prof. PhD.		
Lecturer(s):	Kiefer, Björn / Prof. PhD.		
Institute(s):	Institute of Mechanics and Fluid Dynamics		
Duration:	1 Semester(s)		
Competencies:	Students will elevate their understanding of the mathematical foundations of continuum solid mechanics. Moreover, they will be familiar with classical theoretical approaches that describe the kinematics, kinetics and constitutive behavior of three-dimensional continua at small and large deformations, including the governing balance laws. The successful participant will be able to apply this knowlegde to the modeling of specific problems in geometrically and physically nonlinear solid mechanics.		
Contents:	Most important ingredients are: • tensor algebra and analysis • balance laws (mass, momentum, energy, entropy) • thermodynamic consistency • spatial and material descriptions • kinematics of continua at finite deformations • definition of various stress measures • constitutive theory		
Literature:	P. Chadwick: Continuum Mechanics: Concise Theory and Problems, Dover Publications, 1999 Gurtin, Fried, Anand: The Mechanics and Thermodynamics of Continua, Cambridge University Press, 2009 Holzapfel: Nonlinear Solid Mechanics: A Continuum Approach For Engineering. John Wiley & Sons, 2000 Lai, Rubin, Krempl: Introduction to Continuum Mechanics. Butterworth-Heinemann, 1993 Malvern: Introduction to the Mechanics of a Continuous Medium, Prentice Hall, 1969		

Types of Teaching:	S1 (SS): Lectures (2 SWS) S1 (SS): Taught in German, too. / Exercises (1 SWS)
Pre-requisites:	**Recommendations:** Basic knowledge in engineering mechanics
Frequency:	yearly in the summer semester
Requirements for Credit Points:	For the award of credit points it is necessary to pass the module exam. The module exam contains: MP/KA (KA if 10 students or more) [MP minimum 30 min / KA 120 min] In German possible.
Credit Points:	4
Grade:	The Grade is generated from the examination result(s) with the following weights (w): MP/KA [w: 1]
Workload:	The workload is 120h. It is the result of 45h attendance and 75h self-studies. To help deepen the understanding of the subject matter, (voluntary) homework problems are given out along with the exercise sheets.

exam details
MP = oral
KA = written

Organizational Aspects: Important documents

- **Examination and Study Regulations**
  for the International Master´s Degree Program in Computational Materials Science
  (official language is german)

- Handbook with **Modul Descriptions**; modul data base (Modulhandbuch; Internet)

  find the documents here: https://tu-freiberg.de/en/study/during-studies/study-documents

- **Matriculation Regulations** of TU BAF (Immatrikulationsordnung) http://www.tu-freiberg.de

- **Class schedule** (Stundenplan), „course catalog“

- For **Emergency** cases: Health Dictionary from DAAD

Your contact persons

Dean of studies:

- **Prof. Bernhard Eidel, Dean of Study (CMS)**
  bernhard.eidel@imfd.tu-freiberg.de

Student advisory service (CMS), Leipziger Str. 30, ground floor

- **Dr. Egle Dietzen**
  Tel.: 03731 39-3094

  Egle.Dietzen@dekanat4.tu-freiberg.de

Office hours for students: on **Mondays 9:30 a.m. - 11 a.m.** and
on **Thursdays 12:30 – 2:30 p.m.** (German time)

Tutor for CMS freshman students

- **Mr. Mirza Kazim Bakher** (CMS Student)
  Mirza-Kazim.Bakher@student.tu-freiberg.de

Organization of CMS

Commission for Study Affairs

- Prof. Eidel (Micromechanical Materials Modelling)
- Prof. Kiefer (Solid Mechanics)
- Prof. Rheinbach (High Performance Computing)
- Tarun Kalpanahalli Prasanna (CMS Student)
- Dinesh Paul Bheesetti (CMS Student)
- Shashanka A. Krishna Herle (CMS Student)

Examination Board

- Prof. Eidel
- Prof. Kiefer
- Prof. Rheinbach
- Dr. El'Khatib
- Ms. Vaishnavi Biradar (CMS Student)

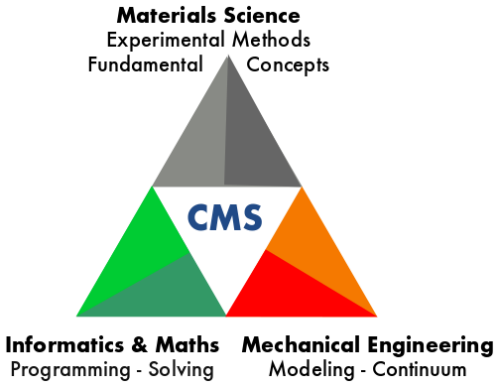
When you're writing an e-mail *in general*…

- "hi xy" is not an appropriate beginning - instead: "Dear Mr./Dr./Prof. XY"
- avoid "WhatsApp"-style
- check your spelling
- read the complete e-mail at least once before you send it

General Comments on Studying CMS

- Attending the courses does not automatically mean that you will “be graduated”

- CMS is in the focus of several disciplines
- You will have to work hard in those disciplines that are new for you
- CMS offers you great possibilities for your future career, but YOU have to use those possibilities!



- If your goal is to do a PhD after CMS, just passing the modules is not enough, you will need TOP grades and TOP knowledge!

How should I study CMS to achieve success? - a personal perspective

- **Consistency** – good habits
- Be **active** and **intensive** – passion for precision
- **Univers(al)ity**
- **Time is finite** – deadlines
- **Wellbeing**

Information
Academic commencement ceremony 2025

ACADEMIC CEREMONY
21 October 2025, at 2:30 p.m.
Alte Mensa, Petersstraße 5

The Rectorate, representatives of the city of Freiberg, the Freiberg Student Union and our Student Council will welcome our new students in a festive atmosphere. Parents and relatives are also very welcome to celebrate this special moment with us.

Important notes on participation:

- **Registration required**: Participation is only possible after prior registration by October 10. You will automatically receive a confirmation email after successful registration.
- **Limited places**: Due to the limited capacity of the Alte Mensa, the number of **accompanying persons is limited to two per student**.
- **Livestream**: For all those who cannot attend on site, the event will be broadcast **live online**. Registration for the livestream is not required. The link will be published on this website shortly before the event begins.
- **Get-together:** After the ceremony, we invite you to a get-together on the Obermarkt.
- dies academicus from 1:00 p.m., festive attire requested.

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Good luck with your studies!