

CURRICULUM

1. Semester	2. Semester	3. Semester	4. Semester
Introduction to Scientific Programming	Selected Topics of Solid State Physics	Plasticity	Master Thesis
Fundamentals of Microstructures	Continuum Mechanics	Stochastic for Materials Science	
Thermodynamics of Materials	Fracture Mechanics Computations	High Performance Computing	
Mechanics of Materials	Numerics of PDE	Experimental Methods: Mechanical Testing, Microstructural Analysis	
Properties of Materials: Metallic Materials, Semiconductors, Ceramic Materials	Molecular Dynamics		
	Soft Skills: German as a second language, Scientific English	Selected Topics of the Finite Element Method	
Dislocation Theory			
Research Seminar and Journal Club			

□ mandatory courses; □ free electives; ■ individual student paper; cp=credit points

WHY STUDYING COMPUTATIONAL MATERIALS SCIENCE AT THE TU BERGAKADEMIE FREIBERG

- ▶ You learn how to describe and design materials by models and how to predict (existing / virtual) material behavior by simulations
- ▶ Unlike most other computational engineering programs, CMS is focused on all relevant modeling techniques for materials behavior
- ▶ The program allows you to "learn by doing", i. e. to gain lots of experience by developing your own simulation tool and to apply existing software
- ▶ There is no tuition fee
- ▶ Classes are small (20 – 25 students) and allow for interactivity
- ▶ We offer students jobs, directly associated with research projects in the institutes: you can learn and earn money!
- ▶ After the master thesis, scholarships for excellent students will be available to continue as a PhD student for a further three years

TU BERGAKADEMIE FREIBERG

Facts about the university

- ▶ founded in 1765 – that's 250 years of teaching tradition
- ▶ campus university located in a charming medieval city with beautiful architecture
- ▶ many international study programs including exchange and double degree programs
- ▶ small classes with excellent teaching quality and highly-motivated lecturers
- ▶ all lecturers are internationally renowned researchers
- ▶ among the top German universities in acquisition of research funding per professor
- ▶ affordable housing cost and living expenses
- ▶ year-round cultural calendar and buzzing student nightlife
- ▶ there are no tuition fees

Application

Fill in the application form on our web site and send complete application package with the required documents to:

TU Bergakademie Freiberg

Dr. Egle Dietzen
 Fakultät für Maschinenbau, Verfahrens- und Energietechnik
 Leipziger Str. 30
 09599 Freiberg / Germany

Registration is possible up to the beginning of the semester. Please wait for positive feedback before transferring the semester fee. We recommend participation in our introduction and orientation week in the winter semester of each year.

CONSULTATION

TU Bergakademie Freiberg
 Central student advisory service
 Akademiestraße 6
 09599 Freiberg
 phone: 03731 39-3827, -3469
 fax: 03731 39-2418
 e-mail: studienberatung@zuv.tu-freiberg.de

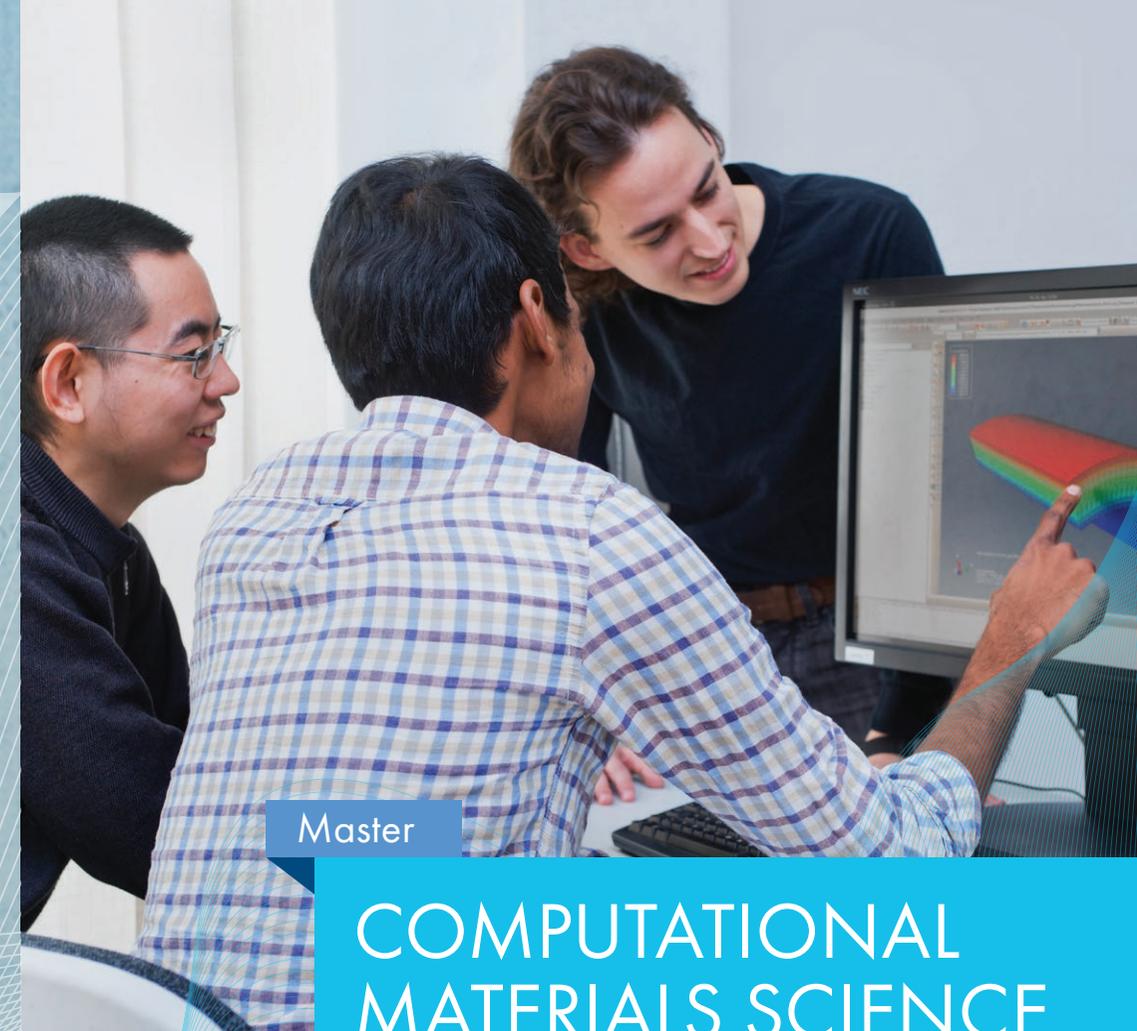
ACADEMIC ADVICE

Faculty of Mechanical, Process and Energy Engineering
 Dr. rer. nat. Egle Dietzen
 Leipziger Str. 30
 09599 Freiberg
 phone: +49 3731 39-3094
 e-mail: admission.cms@imfd.tu-freiberg.de



TECHNISCHE UNIVERSITÄT
BERGAKADEMIE FREIBERG

Die Ressourcenuniversität. Seit 1765.



Master

COMPUTATIONAL MATERIALS SCIENCE

Engineering Sciences



tu-freiberg.de

Effective: March 2017.
 Falsities and modifications are reserved.

COMPUTATIONAL MATERIALS SCIENCE

MASTER

Technological progress of modern society requires engineers and scientists that are perfectly equipped with thorough knowledge of natural and materials sciences and who are highly skilled in programming, data analysis and simulations techniques.

These „Computational Materials Scientists“ will become key players in industrial R&D efforts; they will shape scientific and engineering research concentrating on the design, processing and application of novel high-tech materials with superior mechanical, thermodynamic and electronic properties.

STUDY CONCEPT

At TU Bergakademie Freiberg, we bring together renowned researchers and highly skilled lecturers from different scientific communities to offer our graduate students the education needed for an outstanding career in computational materials science (CMS). Theoretical concepts introduced during CMS lectures will be illustrated by cutting-edge research applications. During research seminars the students will have the possibility to interact with leading scientists and exper-

rienced engineers from industrial partners outside the university. During accompanying hands-on exercises the application of all relevant state-of-the-art simulation methods will be learned – which is one of the truly outstanding aspects of this course. CMS students are chosen among the top 3% of their undergraduate classes, ensuring an excellent and intense study environment. Small classes foster interaction and discussions, and allow students to develop their own ideas.

MASTER

A minimum of 4 semesters (2 years) is required to complete the program. The first semester has the purpose of bringing all students to the same level of materials science, continuum mechanics and programming. The second semester focuses on introducing important simulation methods, the accompanying theoretical and numerical concepts and the advantages and pitfalls of all methods. Advanced aspects of materials science and engineering are introduced in “hands-on” approaches using dedicated simulation tools. During the third semester students can additionally specialize in one of the simulation methods and may choose from elective courses, covering emerging topics such as data-driven materials science and big data methods or advanced topics of plasticity. Their programming skills will be further developed during the “personal project”. The last semester is reserved for the master thesis. CMS is a very dense program, but the “big picture” is important and always present – thanks to the fact that all lectures have been very well synchronized among each other.

duration:	4 SEMESTERS
beginning of the programme:	WINTER TERM
language:	ENGLISH
application deadline:	15 TH APRIL FOR NON EU CITIZENS 15 TH AUGUST FOR EU CITIZENS
degree:	MASTER OF SCIENCE

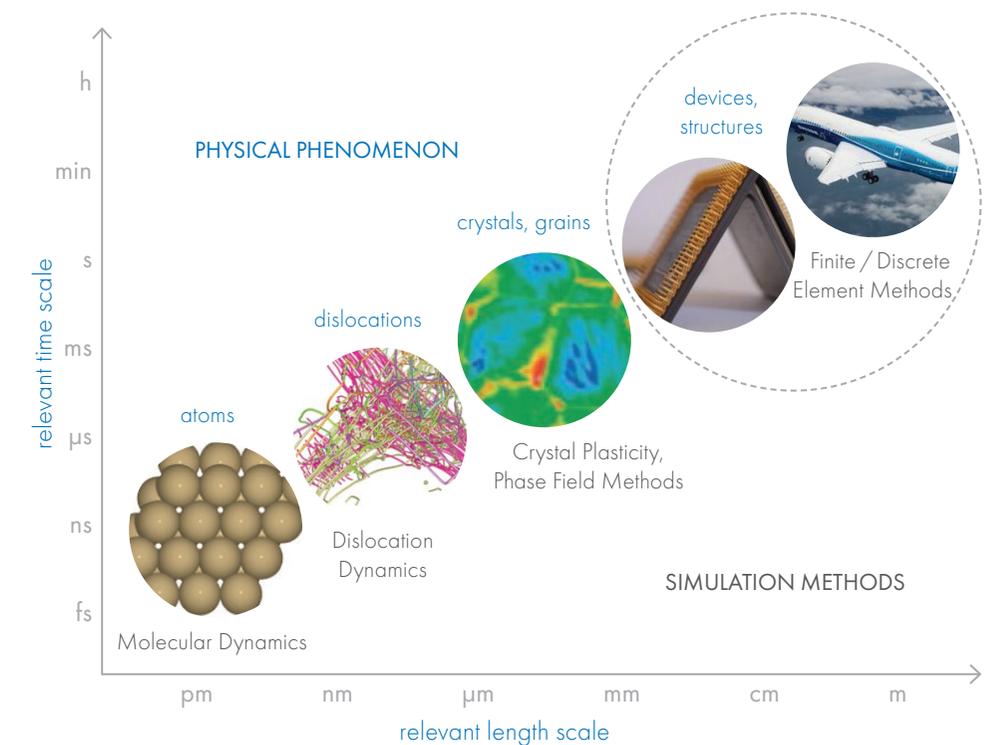
admission requirement:

Bachelor degree (or equivalent) in the field of Mechanical Engineering, Materials Science, (Solid State) Physics or other comparable studies. GPA \geq 75% TOEFL with at least 79 points (internet based), 213 (computer-based) or 550 (paper based) or equivalent tests.

JOB OPPORTUNITIES

The Master program „Computational Materials Science“ (CMS) was tailored to answer the requirements of modern industry R&D environments as well as to the needs of academic research. Fields of interest are among others: automotive, metallurgy, microelectronics, materials manufacturing and process or safety assessment. Our CMS graduates are highly sought-after PhD candidates – not only in Europe and the U.S.

PHENOMENA, SCALES AND SIMULATION METHODS



Specimen, devices and structures might look perfect and homogeneous. But usually there is a number of different physical phenomena on possibly a number of different length and time scales interacting among each other and giving rise to the so-called “micro structure”. For example, a metallic device might contain micro-cracks, may consist of a number of crystallographic grains, each of which contains kilometers of dislocation lines – that ultimately are related to displaced atoms.

Understanding the relation between the microstructure (e.g. grains) and the resulting property (e.g. yield stress or hardening) is the key for designing new materials with superior properties.

Simulations can guide experiments, help to identify new mechanisms and are able to test not yet existing materials in a “virtual lab”. This saves a lot of money in industry and leads the path towards new discoveries in research.