M. Sc. Program Computational Mechanics

TUM Master‘s Days

Munich, 19. March 2024

Agenda

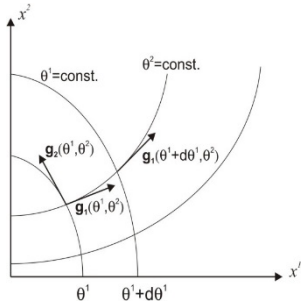
- Key Facts
- Structure and Layout
- Numbers
- Requirements, Application & What to Expect
- Your Questions
- Contacts

Key Facts

Key Facts

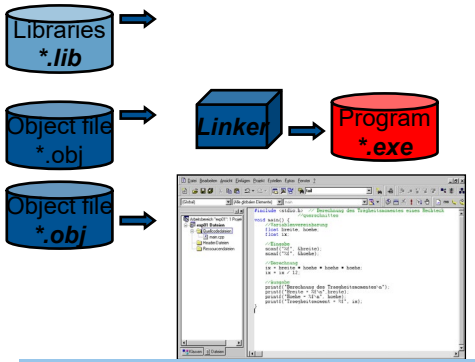
- Founded in 2000, international degree program
- Target group: Bachelor graduates with a focus on mechanical engineering, civil engineering, computer science and applied mathematics
- Interdepartmental consecutive Master of the TUM School of Engineering and Design
- Full time program - 4 semesters with 120 credits in total
- Intake only in the winter semester
- All lectures in English
- Degree: Master of Science (M.Sc)

Study Content



$$\mu u^i\big|^j_j + (\lambda+\mu)u^j\big|^i_j - \rho \ddot{u}^i = 0$$

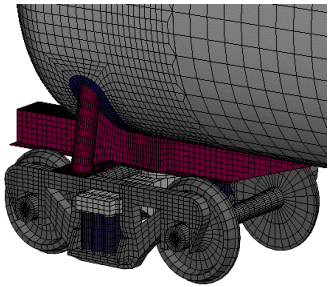
Derivation of differential equations for the description of mechanical systems

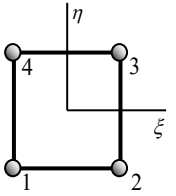


Implementation in software

Solution of technical problems using numerical methods

$$\mathbf{K} = \int_{-1}^{1}\int_{-1}^{1} t\,\mathbf{B}^T \cdot \mathbf{C} \cdot \mathbf{B}\,|J|\,d\xi d\eta$$





Numerical solution methods

New Chances

- Teaching the necessary skills in the field of simulation of mechanical problems and development of numerical methods
- Interface between classical mechanical or civil engineer, and software development
- Career opportunities in a dynamically developing branch of industry
- Leading position in one of the established engineering professions

Fields of Activity

- Simulation and numerical analysis in classical engineering disciplines
- Software development for the solution of problems in fluid and structural analysis
- Development of new analysis tools
- Relevant in all engineering disciplines

Structure and Layout

Main Chairs in Program Design

Chair of Structural Mechanics

Prof. Dr.-Ing. Gerhard Müller

Chair of Computational Modeling and Simulation

Prof Dr.-Ing. André Borrmann

Professorship for Computational Solid Mechanics

Prof. Dr.-Ing. habil. Fabian Duddeck

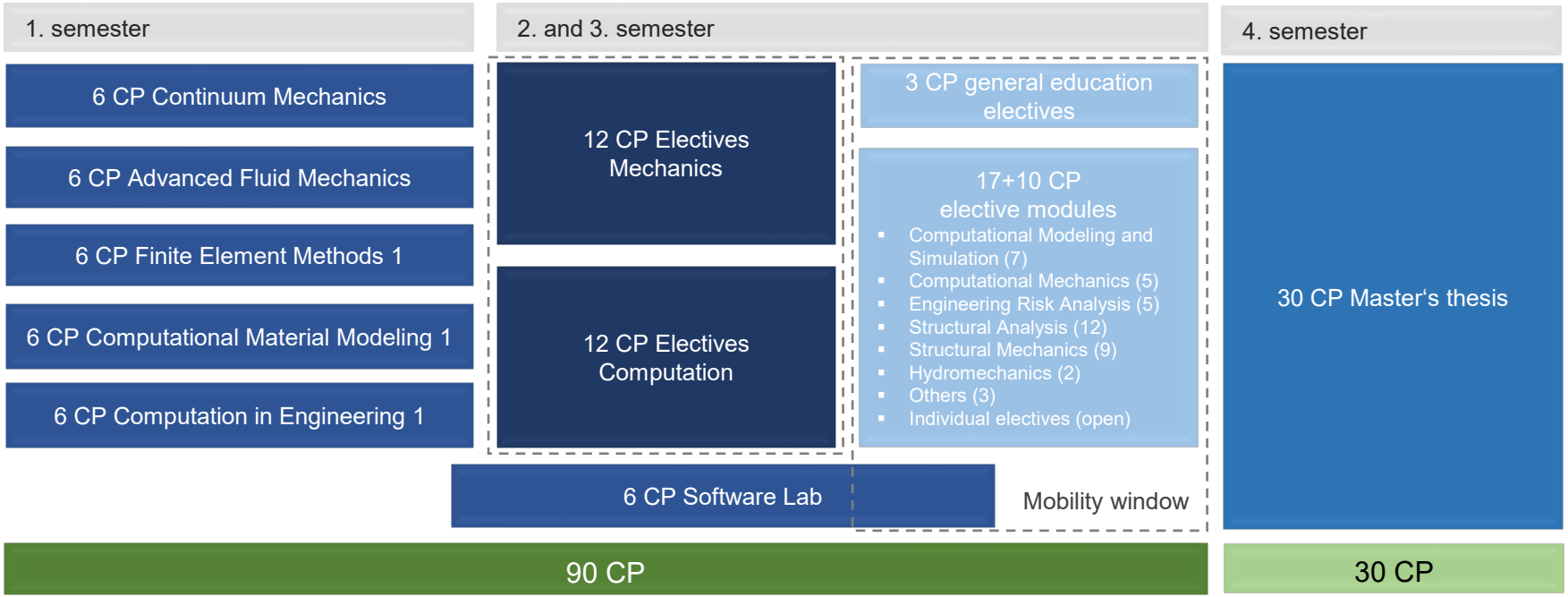
Chair of Hydromechanics

Prof. Dr.-Ing. habil. Michael Manhart

Chair of Structural Analysis

Prof. Dr.-Ing. Kai-Uwe Bletzinger

Curriculum


1. semester
6 CP Continuum Mechanics
6 CP Advanced Fluid Mechanics
6 CP Finite Element Methods 1
6 CP Computational Material Modeling 1
6 CP Computation in Engineering 1
2. and 3. semester
12 CP Electives Mechanics
12 CP Electives Computation
3 CP general education electives
17+10 CP elective modules
Computational Modeling and Simulation (7)
Computational Mechanics (5)
Engineering Risk Analysis (5)
Structural Analysis (12)
Structural Mechanics (9)
Hydromechanics (2)
Others (3)
Individual electives (open)
6 CP Software Lab
Mobility window
4. semester
30 CP Master's thesis
90 CP
30 CP

→ Further info and details in wiki

Curriculum (core electives 2./3. semester)

6 CP Computational Fluid Dynamics

6 CP Computational Material Modeling 2

6 CP Structural Dynamics

6 CP Theory of Plates and Shells

12 CP Electives Mechanics

12 CP Electives Computation

6 CP Finite Element Method 2

6 CP Optimization

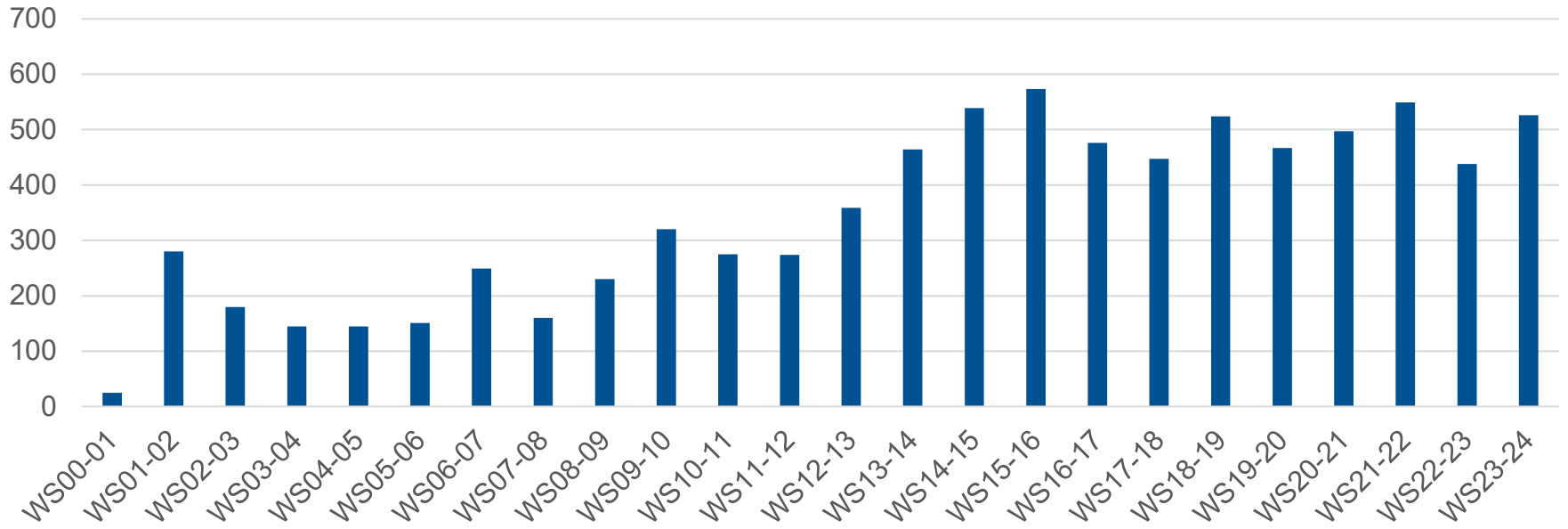
6 CP Functional Analysis & Computational Linear Algebra

6 CP Artificial Intelligence in Computational Mechanics

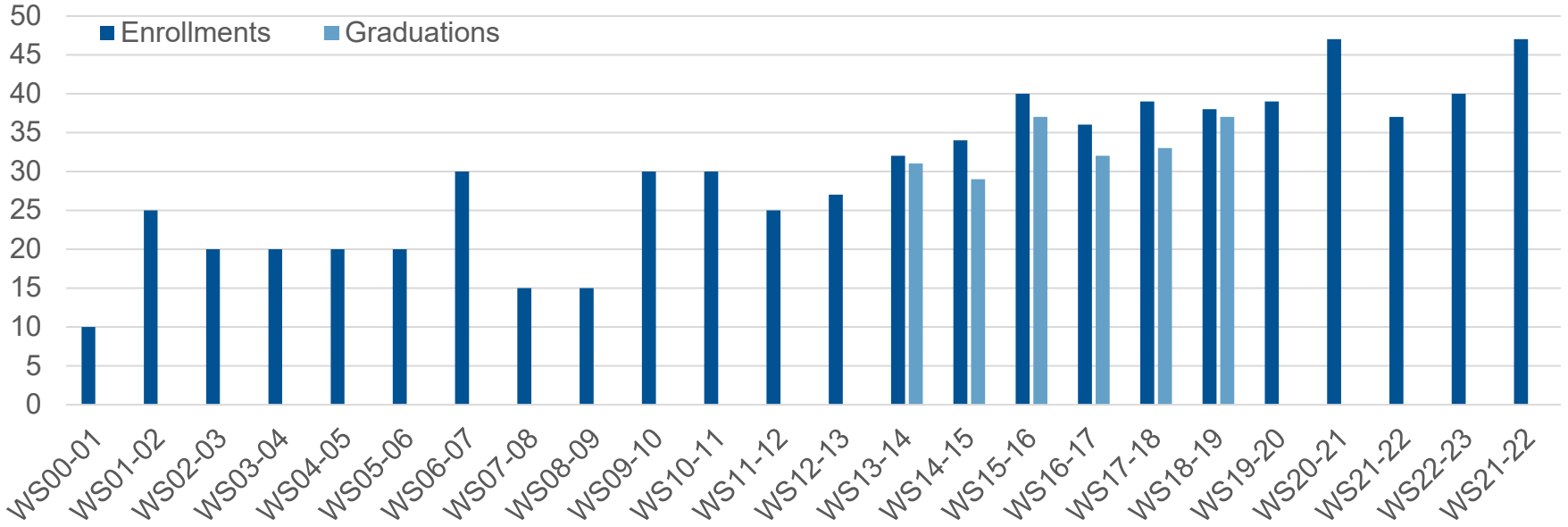
12 CP (2 modules) in each electives catalogue

Numbers

Applications

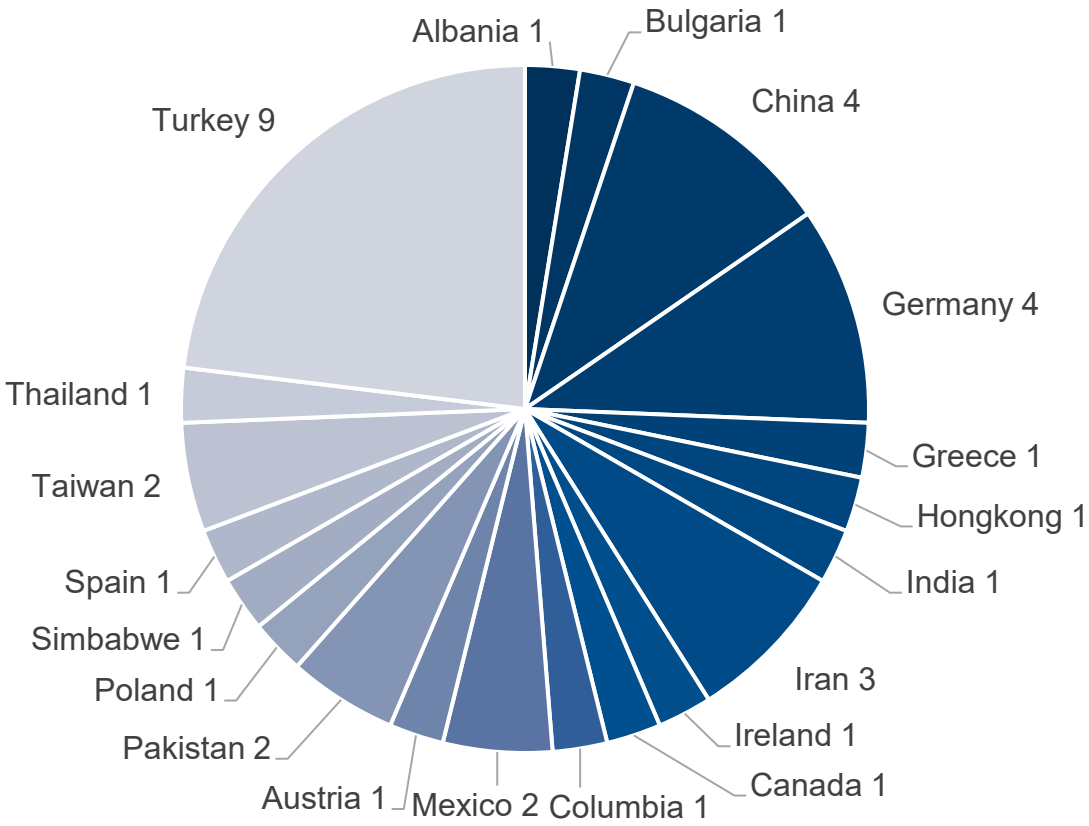


Enrollments and Graduations



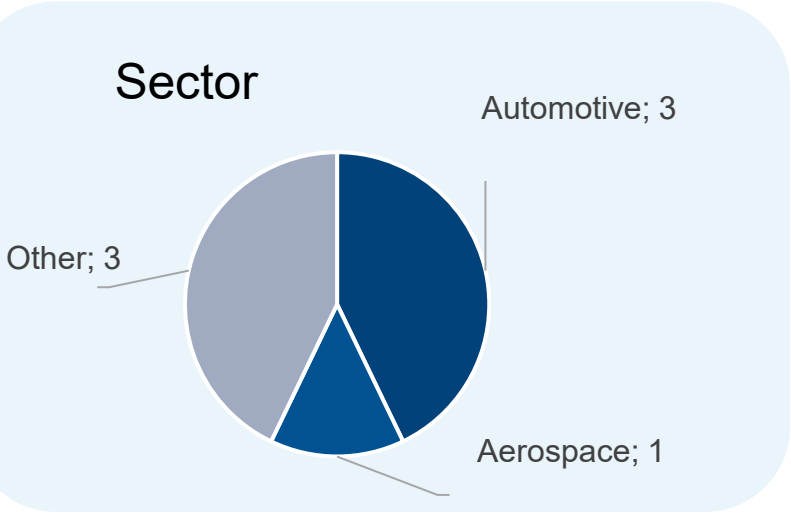
Nationalities I

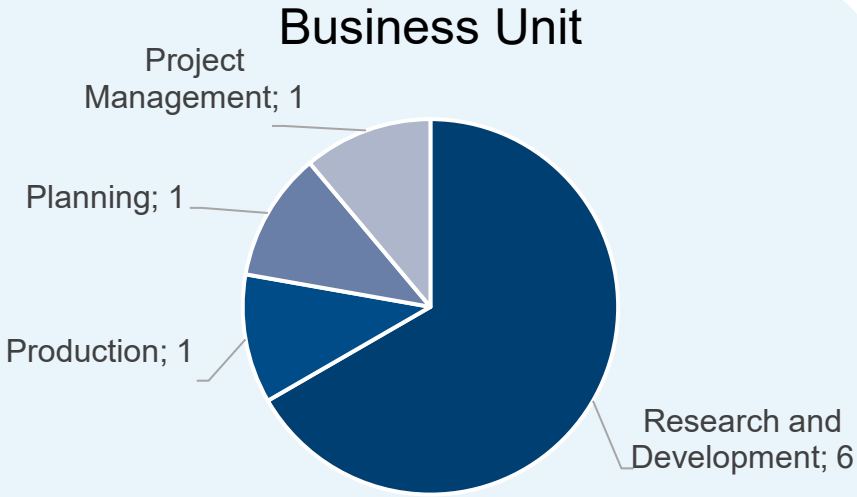
WS 22/23



Career I

Graduate Poll 2020





Further areas of activity:

- Structural Engineering (2)
- Software Development (4)

Requirements, Application & What to Expect

→ Further info and details in CoMe-wiki

Requirements

Above average Bachelor's degree

Sound knowledge of mathematics & mechanics (fluid & structural mechanics)

Fundamental knowledge in informatics

English language proficiency

- TOEFL (IBT ≥ 88)
- IELTS (≥ 6,5)
- CAE, CPE (A,B,C)
- Bachelor's in English

→ Pass Aptitiude Assesment

Aptitude Assesment

Two stage procedure

Submission of

- Transcript
- CV
- Letter of Motivation
- Essay
- Letter of Reference

First stage: assesment of application in first stage: up to 100 points

- < 65 points: rejection
- ≥ 65 points, < 75 points: interview
- ≥ 75 points: admission

Second stage: interview

- < 90 points: rejection
- ≥ 90 points: admission

→ Further info and details on TUM-webpage

Tuition Fees

No tuition fees for students

- from Germany, the EEA (EU + Iceland, Liechtenstein and Norway) and some more
- who have acquired their Bachelor's or higher education in the German education system

Tuition fees: 6,000 € per semester

Various scholarships and exemptions

- Deadline for Application: 31. May 2024

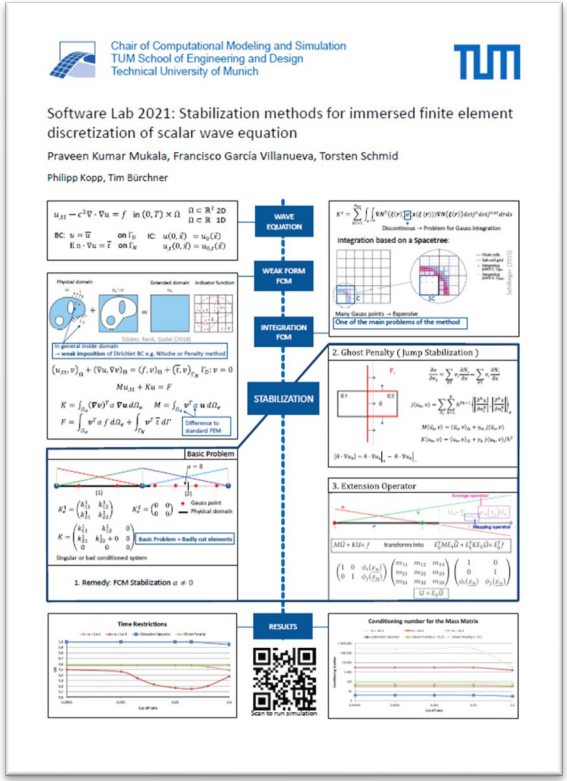
What to expect

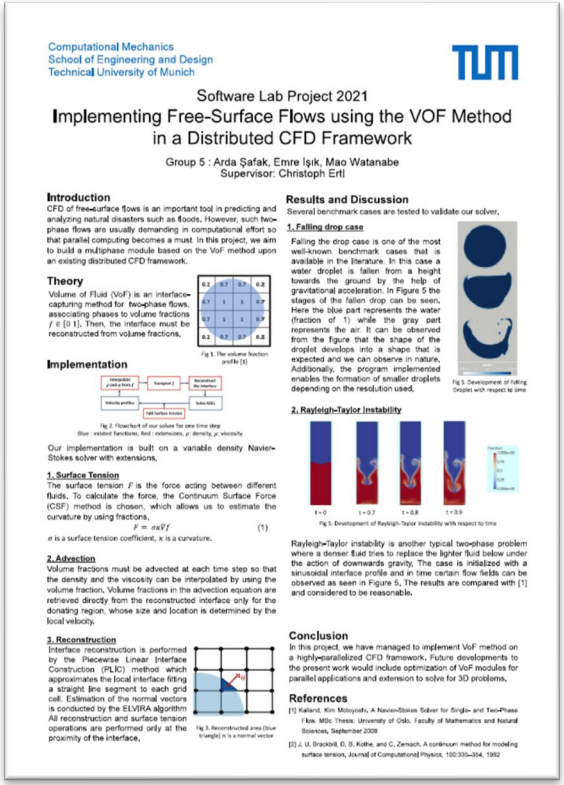
- Interdisciplinary & intercultural teaching and studying
- Onboarding at beginning of studies: welCoMe week & C++ introduction
- Project work: Software Lab
- Care and support in small groups
- Individualizable curricula through "individual electives”
- Part of the Elite Netzwerk Bayern under the umbrella of the Bavarian Graduate School of Computational Engineering

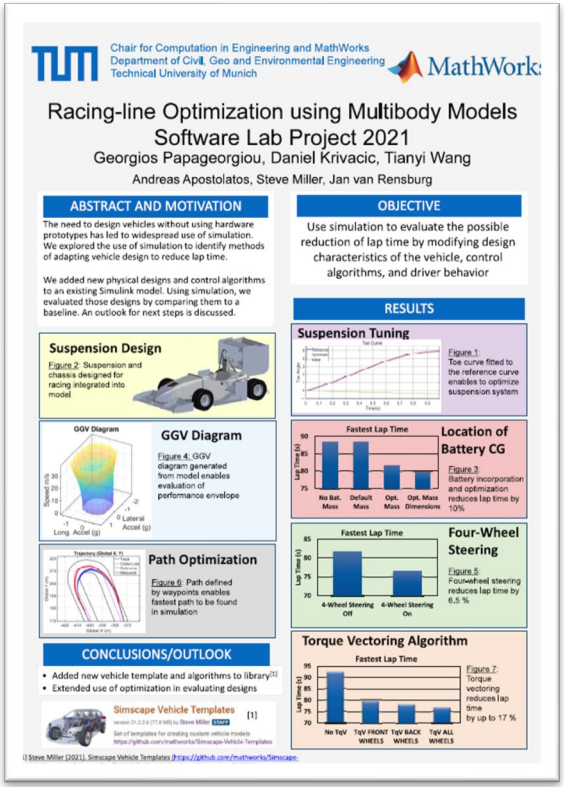
Software Lab

- Implementation of a mechanical/engineering problem into a software solution
- Projects from academic and industrial background
- Simulation of team-oriented and hands-on software development
- Work in small groups (3-4 students)

Software Lab







Your Questions

Related to Aerospace

- Computational Mechanics does not strictly focus on Aerospace
- It serves as a interdisciplinary platform and brings together students and researchers from various engineering disciplines
- CoMe alumni working in aerospace, however, not main field of activity
- CoMe allows inclusion of individual elective modules (up to 10 ECTS) from other departments

Related to Thermal Processes/Power Plants

- Same arguments as for Aerospace hold
- No specific treatment of thermal phenomena/power plants

Software and Simulation Engineering/Computational Science

- Coming from Computational Science

  → strong background in mechanics (solid and fluid) necessary

- Going to software and simulation engineering

  → Definitely possible for software products that deal with engineering topics

Structural Engineering

- Core focus of CoMe is Mechanics

→ Strong background and education in structural analysis and mechanics is offered

→ Various offers in FE technology (but also others) and in-depth understanding of the underlying principles

Further Information and Contact

Sebastian Schopper, M. Sc.

Felix Schneider, M. Sc.

Email: come@tum.de

Homepage: www.come.tum.de

Thank your your interest!

Follow the TUM School of Engineering and Design: **#tumed**