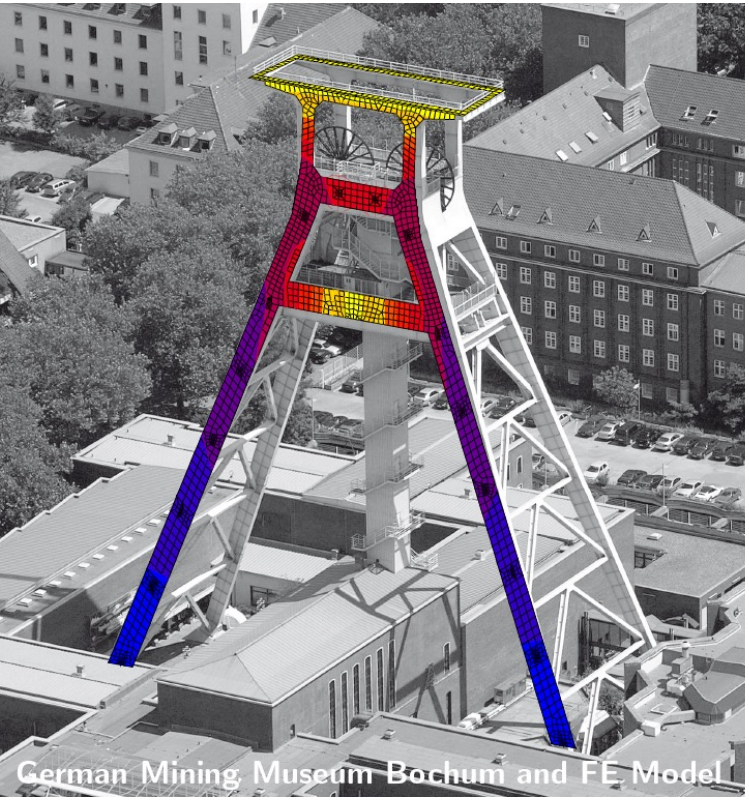

German Mining Museum Bochum and FE Model

WELCOME

to the introductory presentation

Of the Institute for Structural Mechanics

in

Summer Semester 2024

Overview on courses held in SS 2024

Prof. Dr. Roger A. Sauer

Lehrstuhl für Statik und Dynamik, IC 6/185, Tel: 0234 / 32-29051

www.sd.rub.de

E-mail: roger.sauer@rub.de

Courses held in SS 2024

1. Advanced Finite Element Methods (CE-WP04)

   Finite Element Methods for nonlinear Structural Analysis (BI-WP05)

2. FEM for Nonlinear Analyses of Materials and Structures (CE-WP06, BI-WP44, SE-CO-10)

3. Numerical Simulation in Geotechnics and Tunneling (CE-WP09, SE-CO-3)

   Numerische Simulation im Tunnelbau (BI-WP-24)

4. Object-oriented Modeling & Implementation of Structural Analysis Software (CE-WP10)

   Objektorientierte Modellierung und Programmierung der Finite-Elemente-Methode (BI-W39)

5. Applied Computational Simulations of Structures (CE-WP11)

   Angewandte statische und dynamische Tragwerkssimulationen (BI-WP06)

6. Recent Advances in Numerical Modeling and Simulation (CE-W04, BI-W35)

7. High-Performance Computing on Multicore Processors (BI-WP56, CE-WP25, SE-O8)

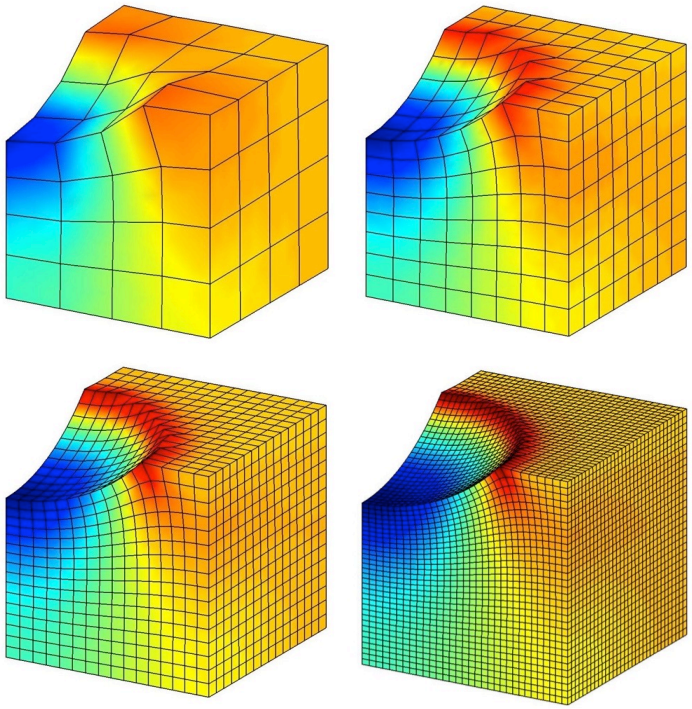
8. Scientific C++ Programming (Advanced) (CE-W10)

CE-WP04 – Advanced Finite Element Methods
BI-WP05 – Finite Element Methods for nonlinear Structural Analysis

Compulsory Optional Course in Computational Engineering, Civil Engineering

(KIB-Bemessung und Konstruktion und KIB-Digital Design and Construction, und Geotechnik und Tunnelbau)

- Nonlinear finite element methods
- Theory and Numerics
- Structural stability problems



- **Lectures: Wednesdays (8:30-10:00)**, room **IC 03/606**

  Exercises: Mondays (10:00-11:45), room **IC 04/408**
- **Moodle-Course** „Advanced Finite Element Methods (MSc-CE-WP04) / Finite Elemente Methoden für nichtlineare Strukturanalysen (MSc-BI-WP05)“ : Announcements, etc.

  https://moodle.ruhr-uni-bochum.de/course/view.php?id=27013 (no password)
- Assistants: Rodolfo Williams & Giao Vu
- **Exam**: 120 Minuten
- **6 Credit points**

Contact:

M.Sc. Rodolfo Williams: rodolfo.williamsmoises@rub.de

M.Sc. Giao Vu: Thi.VU-h6d@ruhr-uni-bochum.de

STRUCTURAL MECHANICS

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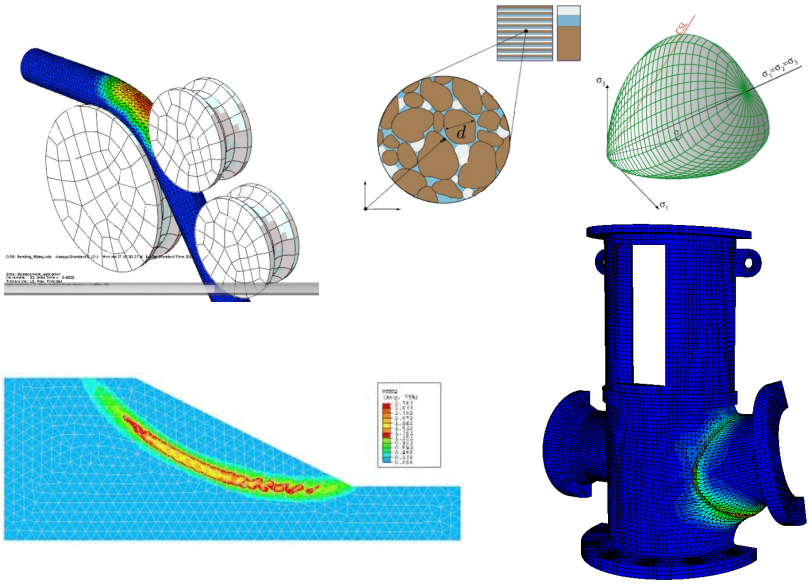
RUB

2 FEM for Nonlinear Analyses of Materials and Structures (CE-WP06, BI-WP44, SE-CO-10)

Compulsory Optional Course in Computational Engineering, Subsurface Engineering, Civil Engineering
(KIB-Bemessung und Konstruktion; Geotechnik und Tunnelbau)

- Focus on elastoplastic materials
- Efficient algorithmic formulation and solution methods – Return map algorithm
- Implementation of material models into finite element software

- For BI & SE: part of the module "Constitutive Models for Geomaterials" (3+3 CP)
- For CE: independent course (3 CP)



- **Lectures & Exercises: Short Course from 5th of June to 17th of July 2024**

  (Wednesdays 16:00 – 18:30, IC 03/649)

- **Moodle-Course:** "Finite Element Methods for Nonlinear Analysis of Inelastic Materials and Structures":

  https://moodle.ruhr-uni-bochum.de/enrol/index.php?id=38207 (no password)

- **Project work/exam:**
  - Solution of practical programming exercises
  - Final exam

Contact:
M. Sc. Vladislav Gudžulić
vladislav.gudzulic@rub.de

STRUCTURAL MECHANICS

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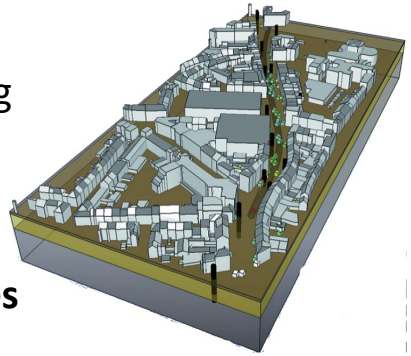
3 (CE-WP09 / SE-CO-3) - Numerical Simulation in Geotechnics and Tunneling (BI-WP-24) – Numerische Simulation im Tunnelbau

Compulsary Optional Course in Computational Engineering, Subsurface Engineering, Civil Engineering (BI) with specialization in Geotechnics & Tunneling

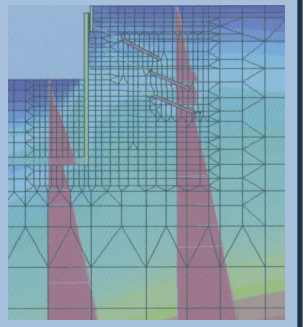
Numerical Simulation in Tunnelling

- FEM simulation in tunnelling
- Computer-lab exercises
- 3 credit points
- **Computer exam: 90 minutes**



Numerical Simulation in Geotechnics

- Application of FEM in geotechnics
- 3 credit points
- Computer exam: 90 minutes
- Contact: Chair of Soil mechanics
- Dr.-Ing. Christoph Schmüdderich



- Computer Exercises:

Every Friday from 12th, April 2024, 8:30-11:30

- Room: CIP - IC 04/634
- **Moodle-Course**
  - „Numerical Simulation in Tunneling (MSc-CE-WP09 / SE-CO-03)“
  - „Numerische Simulation im Tunnelbau (BI-WP-24)
- https://moodle.ruhr-uni-bochum.de/course/view.php?id=22150

(pw: #numsimtunss24)

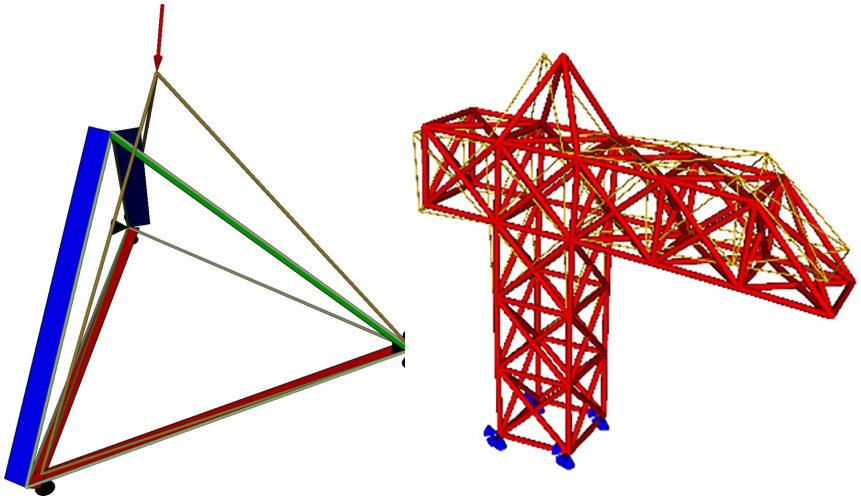
To complete the Module (6 CP) = pass BOTH parts

Contact:
Dr.-Ing. Ba Trung Cao, e-mail: ba.cao@rub.de

CE-WP10 – Object-oriented Modeling & Implementation of Structural Analysis Software
BI-W39 – Objektorientierte Modellierung und Programmierung der Finite-Elemente-Methode

Compulsary Optional in Computational Engineering, Optional for Civil Engineering

- Implementation of finite element models in an object-oriented finite element program for the analysis of truss structures.
- Linking theory of finite element methods with object-oriented programming
- Project work - finite element program developed by students



- Lectures & Exercises integrated: **Block Course 22. July to 2. August 14:00-17:00**
- Classroom seminar
- **Moodle-Course** „ Object-oriented Modelling and Implementation of Structural Analysis Software (MSc-CE-WP10)“: https://moodle.ruhr-uni-bochum.de/m/course/view.php?id=10955 (No password)
- Please sign up for notification
- **Project work + oral exam**: Implement finite element software for structural analysis. The date for exam will be announced during the course.
- 3 credit points

Contact:
Prof. Dr.-Ing. Matthias Baitsch
e-mail: Matthias.Baitsch@hs-bochum.de
M.Sc. Yaman Zendaki, e-mail: Yaman.Zendaki@rub.de

STATIK DYNAMIK

RUHR-UNIVERSITÄT BOCHUM

5 CE-WP11 – Applied Computational Simulations of Structures

Compulsory Optional Course in Computational Engineering

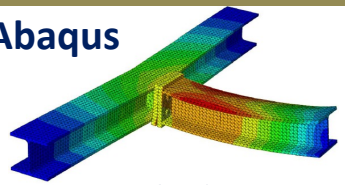
5 WP06 – Angewandte statische und dynamische Tragwerkssimulationen

Wahlpflichtmodul für Studienrichtungen KIB-Bemessung und Konstruktion und KIB-Digital Design and Construction

Parts: **a) Seminar**: 2 SWS **b) Exercise**: 1 SWS/ **Lecture**: 1 SWS. **Total credits**: 6 CP

a) Applied Finite Element Methods

- **Software: Abaqus**



- **Moodle-Course:** Applied Computational Simulations of Structures (MSc-CE-WP11) / Applied Finite Element Methods (no password)
- **Assesment:** Project work

Contact:

M.Sc. Koussay Daadouch koussay.daadouch@rub.de

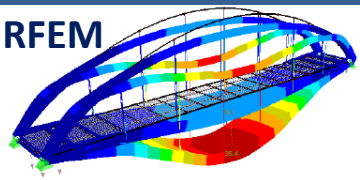
M.Sc. Vladislav Gudzulic vladislav.gudzulic@rub.de

Goals

- Handling of commercial FE software
- Pre- and post-processing
- Modeling methods and sources of errors

a) Angewandte Finite-Elemente-Methoden

- **Software: RFEM**



- **Moodle-Kurs:** Angewandte Finite-Elemente-Methoden (BI-WP06) (kein Passwort)
- **Prüfungsform:** Projektarbeit

Contact:

M.Sc. Rodolfo Williams rodolfo.williamsmoises@rub.de

Dr. Gerrit Neu gerrit.neu@rub.de

b) Finite Element Methods in Linear Computational Dynamics

- Basic of FEM in structural dynamics
- Explicit and implicit integration methods
- Computer lab: implementation of algorithms

- **Moodle-Course:** Finite Element Methods in Linear Computational Dynamics (CE-WP11) / Finite-Elemente-Methoden in der linearen Strukturdynamik (BI-WP06) [SoSe24] (no password)
- **Assesment:** Homework

Lecture: Fridays 14:00 – 18:00

HZO-70 / CIP Pool 04/630

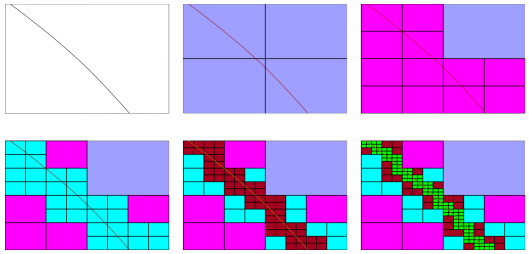
Contact:

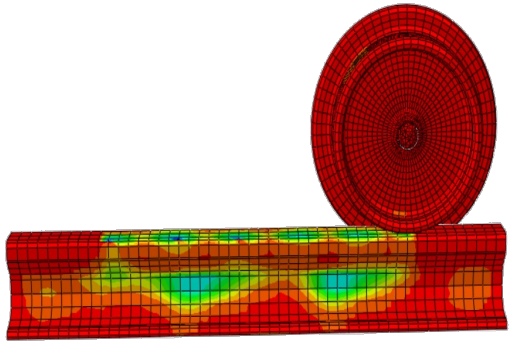
Dr. Sahir Butt: sahir.butt@rub.de

6 (CE-W04, BI-W35) – Recent Advances in Numerical Modeling and Simulation

Optional Course

- Presentation of advanced topics in computational mechanics (e.g. Isogeometric analysis, Finite Cell method, contact mechanics etc.)
- Series of lectures covering different topics, further elaborated by students





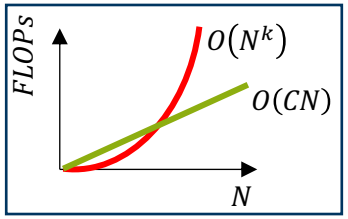
- Lectures to be announced, 1st lecture beginning of June
- Moodle-Course „ Recent Advances in Numerical Modelling and Simulation (Msc-BI-W35, MSc-CE-W04)“: https://moodle.ruhr-uni-bochum.de/m/course/view.php?id=10954 (no password)
- Please sign up for notification.
- Student presentation and discussion of selected topic
- 2 credit points

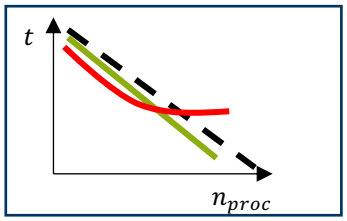
Contact:
M.Sc. Yaman Zendaki, e-mail: Yaman.Zendaki@rub.de

High-Performance Computing on Multicore Processors (BI-WP56 / CE-WP25 / SE-O8)

Compulsory Optional Course in **Computational Engineering**
Applicable to **Bauingenieurwesen, Subsurface Engineering, Angewandte Informatik**

- Parallel programing on multi- and many-core systems
- State-of-the-art parallelization frameworks and techniques
- Design of programs for multicore processors
- Critical evaluation of multi-threaded programs and shared-memory access patterns





© HLRS

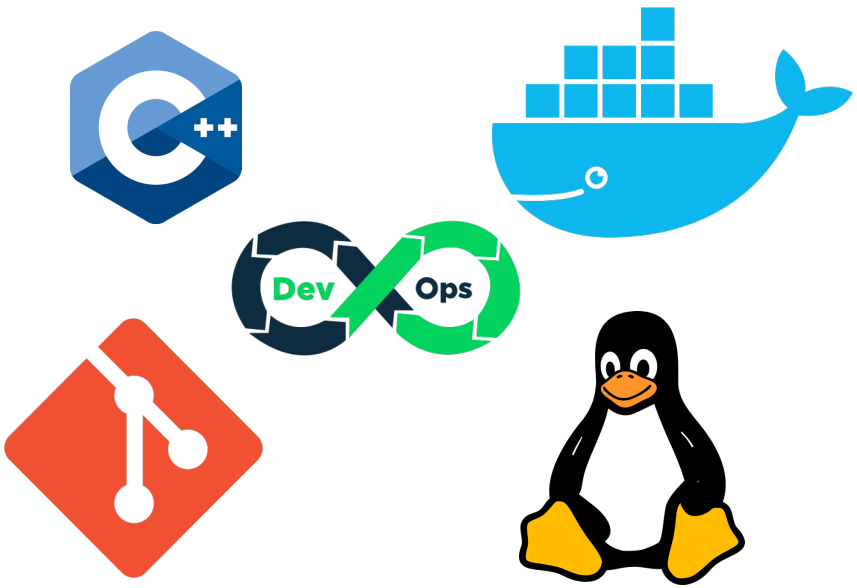
- **Course format:**
  - 2h lectures, **Wednesdays, 10:15-11:45h, IA 02/445**
  - 2h exercises, **Fridays, 10:15-11:45, IC 04/630 CIP-Pool**
- **Moodle-Course**:
  - **High-Performance Computing on Multicore Processors (MSc-BI-WP56 / MSc-CE-WP25 / MSc-SE-O8) (126509-SS 2024)**
  - Announcements, video lectures, slides, etc.
- **Written examination: 27.08.2024, 10-12h**
- 6 Credit points

Contact:
Poria Saberi
seyed.saberi@rub.de

Scientific C++ Programming (Advanced) (CE-W10)

Optional Course in **Computational Engineering**
Contact examination office for **Bauingenieurwesen, Subsurface Engineering, Angewandte Informatik**

- Advanced programming concepts in C++
- Design and development of modern C++ applications
- Object-oriented programming
- Generic programming
- Modern features from C++11-C++23



- **Block course:**
  - **22-26 July**, 9-16h, IC 04/630 CIP-Pool
  - 3h lectures, 3h exercise per day
- **Moodle-Course**:
  - **Scientific C++ Programming (Advanced) (MSc-CE-W) (128516-SS 2024)**
  - Announcements, slides, etc.
- **Written examination: 23.08.2024, 10-12h**
- 3 Credit points

Contact:
Poria Saberi
seyed.saberi@rub.de