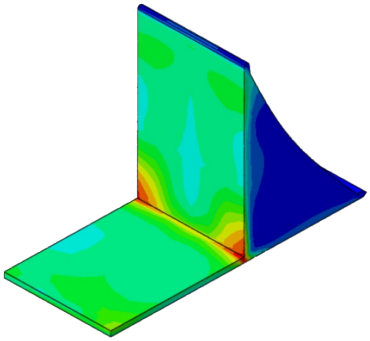
Univ.-Prof. Dr. rer. nat. Wolfgang H. Müller
Technische Universität Berlin
Fakultät V – Institut für Mechanik
FG Kontinuumsmechanik und Materialtheorie
Sekretariat MS 2
Einsteinufer 5
10587 Berlin

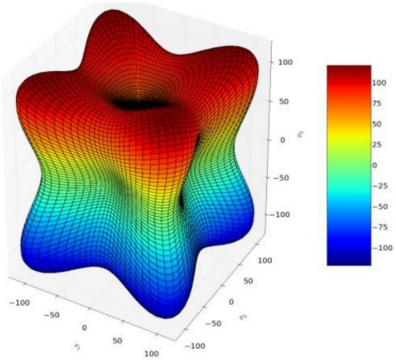
Module descriptor

– summer term 2024 –

Hands-on project to finite element analysis

PJ 0530 L 164 6 ECTS





Informations related to the course:

Taking best practices from the pandemic times, in the summer term 2024, this module is offered as an online course, at least during its lecture period. Depending on the amount of participants, the practical part of the course might be held in presence. However, for sure, the first introduction lecture will take place in presence (not online) on the 15th of April at 16:00 in MS 107.

In order to establish a contact between the lecturers and the students, it is required that everyone registers on the ISIS webpage of this module. However, a password is required for the registration. Please send an e-mail to Narges Poursangari to obtain the password. If you are a student, who does not have a TU Berlin campus account yet, there is the option of a guest access to the (in German: Gastzugang). The guest access also requires a password, which can be obtained by contacting Narges Poursangari.

Target audience:

This course is part of the module "Mechanische Eigenschaften der Werkstoffe – MEW." Furthermore, this course addresses students majoring in mechanical engineering, aero space engineering, material sciences, mathematics, transport systems, physics and engineering sciences.

Team:

lecturer	Prof. Dr. rer. nat. Wolfgang H. Müller	MS 09	ph.: 314-27682
secretary	Ms. Grit Lamprecht	MS 08a	ph.: 314-22332
teaching assistant	M. Sc. Ana Stankovic	MS 312	ph.: 314-77459
teaching assistant	M. Sc. Narges Poursangari	MS 309	ph.: 314-77476

Lecture time:

lectures, tutorials, consultation hours

Monday,	16:00 to 18:00 ,	starting 15.04.2024	
	Zoom meeting,	Meeting-ID: 638 8595 8621,	Passcode: 378526
Friday,	14:00 to 16:00 ,	starting 19.04.2024	
	Zoom meeting,	Meeting-ID: 655 4639 1891,	Passcode: 091206

All lectures, tutorials and consultation hours will take place online using the Zoom video conference software.

Learning outcomes:

- Obtaining background information on advanced strength of materials theory;
- handling commercial finite element software;
- solving a complex stress analysis problem;
- soft skills: solving engineering problems collaboratively in teams, presenting and documenting results;

Course procedure and exam regulations:

In this course, a stress and fatigue analysis of microelectronic components shall be performed using the finite element software Abaqus. In the first 6 to 7 weeks, conventional lectures and tutorials teach the following topics:

- Introduction to manufacturing technology in modern microelectronics (Surface Mount Technology, SMT),
- introduction to materials used in SMT,
- basic mechanics of elastoplasticly deformable bodies,
- description directionally depend materials,
- basic concepts of plasticity and creep,
- fatigue and lifetime analysis.

The lectures are accompanied by short questions and homework exercises. The short questions will be made available online at the end of each week and must be answered during the following week. All short questions must be answered to qualify for a participation in one of the projects. In the homework exercises, the finite element program Abaqus is learned and used. At the end of the lecture and tutorial series, a midterm screening is performed. A maximum of 20 points can be obtained. For a qualified participation in one of the projects, it is necessary to obtain a minimum of 15 points in the midterm screening and to complete the homework exercises. Otherwise, we strongly advise to participate in one of the projects in a later semester.

During the following 5 to 6 weeks, the students solve a given stress and fatigue analysis problem for a SMT-component using Abaqus. This task is performed in groups of 5 persons maximum. The groups are formed after the midterm screening. Advices regarding the project task are given during consultation hours. The groups themselves have to ensure that the work load is evenly distributed among the group members.

It is mandatory to submit a project report in the form of a scientific paper in order to take the oral exam at the end of the lecture period. The oral exam consists of a 15 minutes presentation on the project's results and a subsequent 30 minutes interview.

The assessment of the student's performance and grades is entirely based on the result of the oral exam.