

Information to the Lecture

Engineering Mechanics I

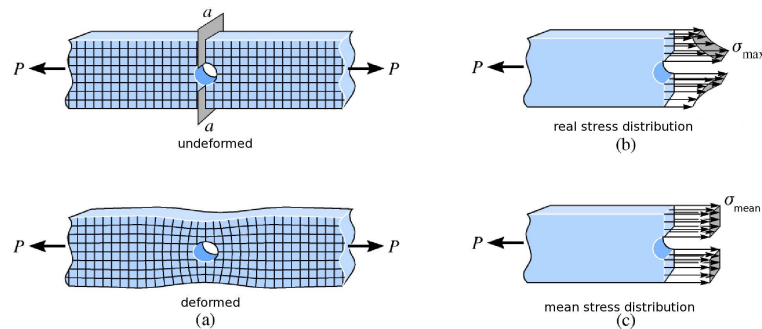


Fig.: Stress concentration [1]

Contents of the lecture

The lecture provides the basic knowledge for the calculation of static mechanical systems in Engineering Mechanics. Based on the notion of force, different equilibrium states are analyzed such as plane and spatial force systems on solid bodies. The calculation of internal reaction forces and moments of plane and space trusses will be discussed. In addition to the equilibrium axiom, the principle of virtual displacements of analytical mechanics is introduced. Within the framework of the statics of straight rods, the calculation of inner forces will be discussed under consideration of elastic and elasto-plastic material laws.

Dates, exam, lecture notes

Lecture date	Mon, 09:45-11:15, Franz-Grashof-HS, bldg 10.91, and Tue, 09:45-11:15, Ferdinand-Redtenbacher-HS, bldg 10.91
First lecture	Thu, 24.10.2024, 09:45-11:15, Ferdinand-Redtenbacher-HS, bldg 10.91
Tutorial	Fri, 11:30-13:00, Hörsaal am Fasanengarten, bldg 50.35
First Tutorial	Fri, 31.10.2025, 11:30-13:00, Hörsaal am Fasanengarten, bldg 50.35
Exam	written examination (90 minutes)
Credits	5 SWS, 7 CP
Lecture notes	available at Skriptenverkauf, Adenauerring 7
Contact	Dr.-Ing. Loredana Kehrer, Dr.-Ing. T.-A. Langhoff, M.Sc. J. Gisy

Literature

- [1] Hibbeler, R.C: Engineering Mechanics - Statics, 11th edition. Prentice Hall Pearson Study (2007).
- [2] Gross, D. et al.: Engineering Mechanics 1: Statics. Springer, Berlin (2009).
- [3] Anthony M. Bedford, Wallace Fowler: Engineering Mechanics: Statics, 5th edition. Prentice Hall Pearson Study 2007

Contents of the lectures

- **Basic vector calculations**

Vectors; linear dependency; scalar product; cross product; scalar triple product; applications of vector calculus

- **Force systems**

Forces; torsional moment; equivalent force systems; special force systems; force densities; normal stress; shear stress; resulting moment of force densities; line of action of resultant forces; equilibrium systems

- **Statics of rigid bodies**

Equivalent systems of rigid bodies; free body diagram; support types and support reactions; reaction forces and external loadings; statically and kinematically determinate systems

- **Internal forces and moments in bars and beams**

Differential equation of internal reactions; internal reactions in straight bars and beams; trusses

- **Adhesion and Friction**

Adhesion; friction; friction of belts

- **Center of gravity and mass center point**

Mass density; mass; law of gravitation; gravitational force; center of mass; center of volume; center of gravity

- **Work, energy, principle of virtual displacements**

Work; energy; principle of virtual displacements; stability of equilibria

- **Static of underformable ropes**

Differential equations of rope force and rope curve; basic types of loadings; exact solutions; approximate solutions

- **Elastostatics of tension rods and struts**

Stresses; strains; Hooke's law; statically indeterminate problems; notch effect; dimensioning and material selection; elastic trusses; admissible stresses