

# 1.050 Engineering Mechanics

Lecture 11:

Strength models

3D model – Mohr Circle

# 1.050 – Content overview

## I. Dimensional analysis

1. On monsters, mice and mushrooms
2. Similarity relations: Important engineering tools

Lectures 1-3  
Sept.

## II. Stresses and strength

2. Stresses and equilibrium
3. Strength models (how to design structures, foundations.. against mechanical failure)

Lectures 4-15  
Sept./Oct.

## III. Deformation and strain

4. How strain gages work?
5. How to measure deformation in a 3D structure/material?

Lectures 16-19  
Oct.

## IV. Elasticity

5. Elasticity model – link stresses and deformation
6. Variational methods in elasticity

Lectures 20-31  
Nov.

## V. How things fail – and how to avoid it

7. Elastic instabilities
8. Plasticity (permanent deformation)
9. Fracture mechanics

Lectures 32-37  
Dec.

# 1.050 – Content overview

## I. Dimensional analysis

## II. Stresses and strength

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Lecture 8: Beam stress model

Lecture 9: Beam model II and summary

Lecture 10: Strength models: Introduction (1D)

**Lecture 11: Mohr circle – strength criteria 3D**

Lecture 12: Application – soil mechanics: How to build sandcastles

Lecture 13: Strength criterion in beams (I/II)

Lecture 14: Strength criterion in beams (II/II) – convexity of strength domain

Lecture 15: Closure strength models & review for quiz

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## III. Deformation and strain

## IV. Elasticity

## V. How things fail – and how to avoid it

# Christian Otto Mohr (1835-1918)

German civil engineer, one of the most celebrated of the 19<sup>th</sup> century

Important contributions in strength of materials, design of steel trusses, bridges

Professor of Mechanics at Stuttgart Polytechnic and Dresden Polytechnic

Photograph of Mohr removed due to copyright restrictions.

Student of **Mohr**: **Foeppl**, the doctoral advisor of Ludwig **Prandtl**, who was the advisor of Theodore von **Kármán** (Caltech)