

MM 203

Mechanics of Materials

Lecture 1

Introduction to Applications of Solid Mechanics

13th Jan 2020

Course Policies

- Office Hours: Wednesdays 11-12 noon.
- Classes:
 - *Lectures: Tuesday 9:30 AM, Thursday 10:35 AM.*
 - *Attendance : mandatory.*
 - ***Cell-phones should be switched off. -2 penalty first three times, subsequently -5.***
 - *Students who are more than 5 minutes late won't be allowed in the class.*
 - *Bring calculators in the class for problem-solving.*
- Tutorials Policy:
 - *10 in number. (Monday 8:30 AM)*
 - *Will carry 1 % weightage per session.*
 - *Groups formed by me of 5-6 students will work on the assignment individually but can take help of other group members and TA allotted to the group.*
 - *Marks will be awarded in the class on perceived perseverance in solving the assignments.*
 - *Absence from tutorial automatically implies 0 marks.*

Evaluation

- *Midsem: 20%*
- *2 Quizzes: 15%*
- *Assignments done in the tutorial: 10%*
- *Term paper and presentation: 15%+5%(end-sem exam)*
- *Endsem: 35% (Questions with additional 5% weightage will be from the presentations, so end-sem exam will have net 40% weightage.)*
- *1 make-up exam for all the missed exams/quizzes.*
- *Passing percentage: 40% absolute*
- *End sem's syllabus: entire semester's syllabus*

Grade statistics

Coursewise Statistics

Course Code	MM 203
Course Name	Mechanics of Materials
Total Grades Given are	120

Out of Which	
AA	11
AB	10
AU	1
BB	24
BC	4
CC	6
CD	13
DD	44
FR	7
Total	120

2015

Coursewise Statistics

Course Code	MM 203
Course Name	Mechanics of Materials
Total Grades Given are	109

Out of Which	
AA	2
AB	5
BB	3
BC	13
CC	15
CD	24
DD	23
FR	24
Total	109

2016

Out of Which	
AA	7
AB	19
BB	11
BC	8
CC	12
CD	15
DD	22
FR	15
Total	109

2017

Out of Which	
AA	17
AB	12
AP	3
BB	9
BC	16
CC	2
CD	17
DD	22
FR	10
Total	108

2018

Books

- “**Mechanics of Solids**”, Crandall, Dahl, Lardner, Sivakumar.
- “**Mechanics of Materials**”, Gere and Timoshenko, 2nd edition.

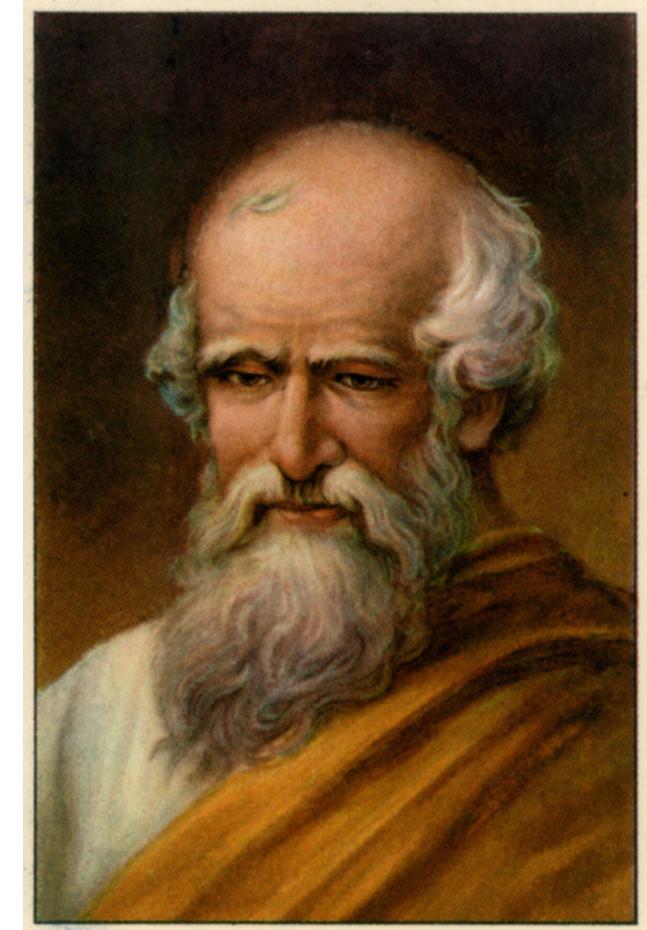
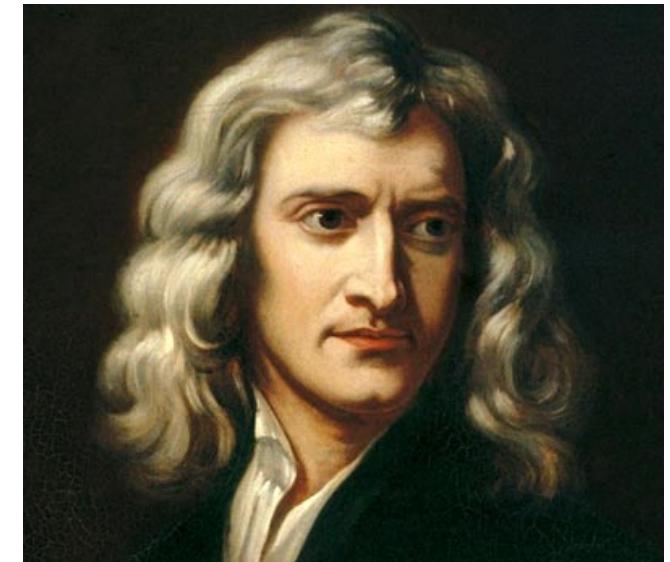
Mechanics of Materials

- Strength of Materials/Solid Mechanics/Mechanics of Solids.
- New lens of looking at the world.
- Make better design and material selection decisions.



History

- Science of forces and displacements.
- Small number of basic concepts: force, mass, length and time.
- Logical deduction leads to detailed prediction of the consequences.
- One of the oldest physical sciences.
- Applied mechanics.
- Rational application of these principles for problem solving.



Failure

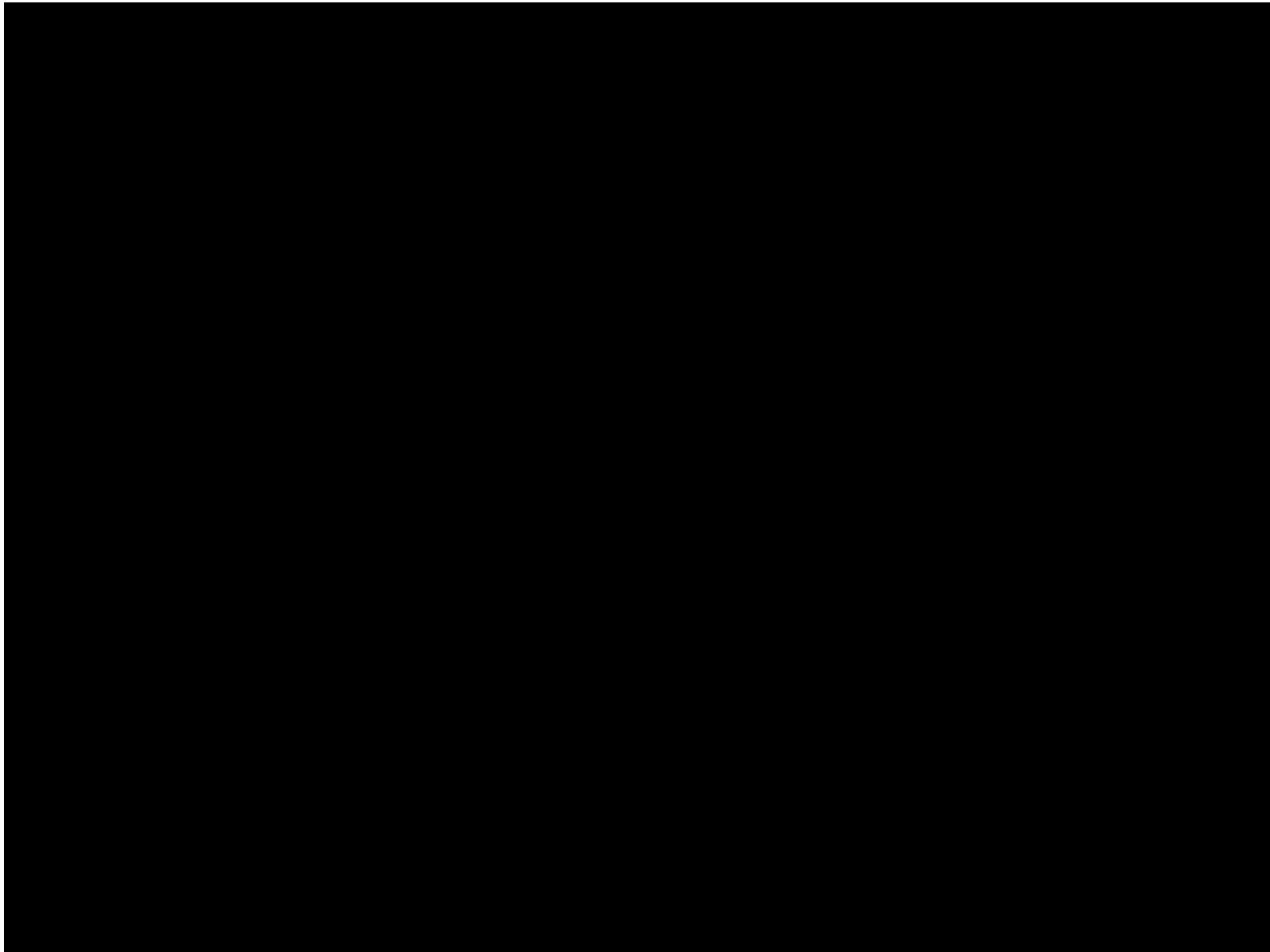
- Different loads: develop stresses and strains.
- Lead to failure.
- What is failure?
 - Application.
 - Scales of deformation.
 - Time.



Applications

- Design to prevent failure.
- Make advances in biology happen and improve the life quality and longevity.
- Design better devices for energy to improve lifetime and endow desired properties like flexibility.
- Design shape-changing structures.

Tacoma Bridge



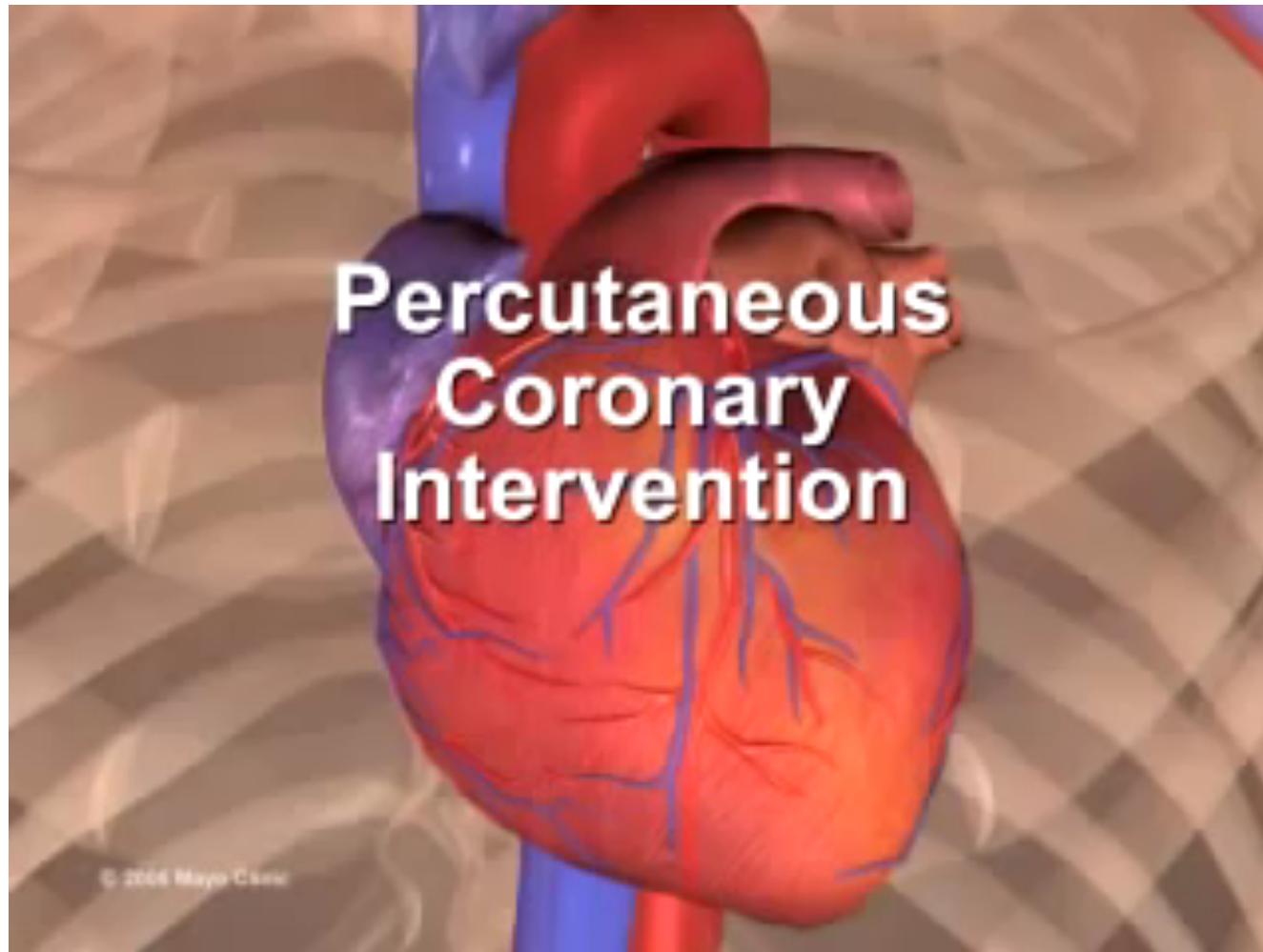
Wind Turbine Blades



Applications

- Design to prevent failure.
- Make advances in biology happen and improve the life quality and longevity.
- Design better devices for energy to improve lifetime and endow desired properties like flexibility.
- Design shape-changing structures.

Stents for angioplasty



Prosthetics



Prosthetics



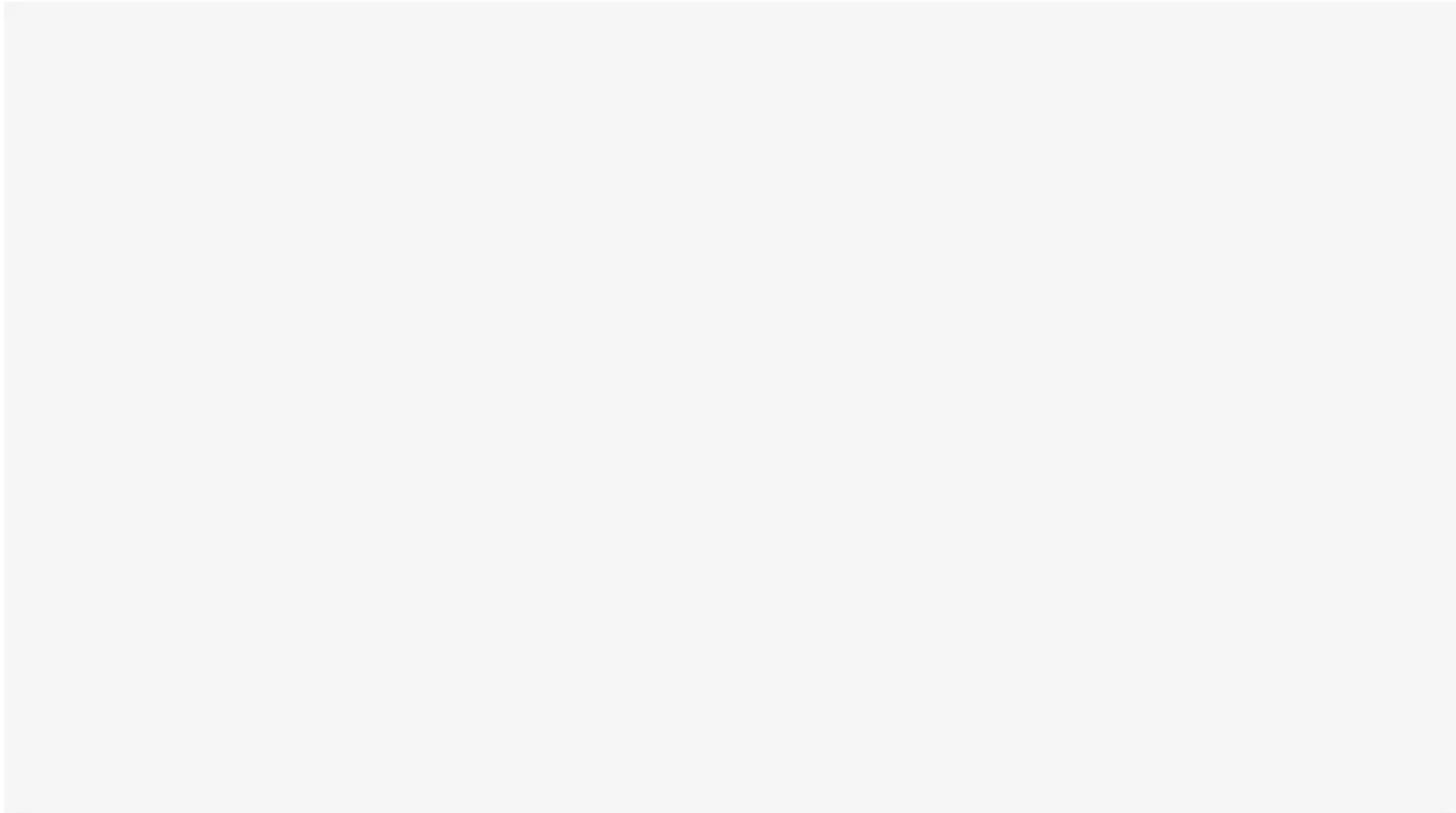
Applications

- Design to prevent failure.
- Make advances in biology happen and improve the life quality and longevity.
- Design better devices for energy to improve lifetime and endow desired properties like flexibility.
- Design shape-changing structures.

Flexible Devices



Lithium ion batteries



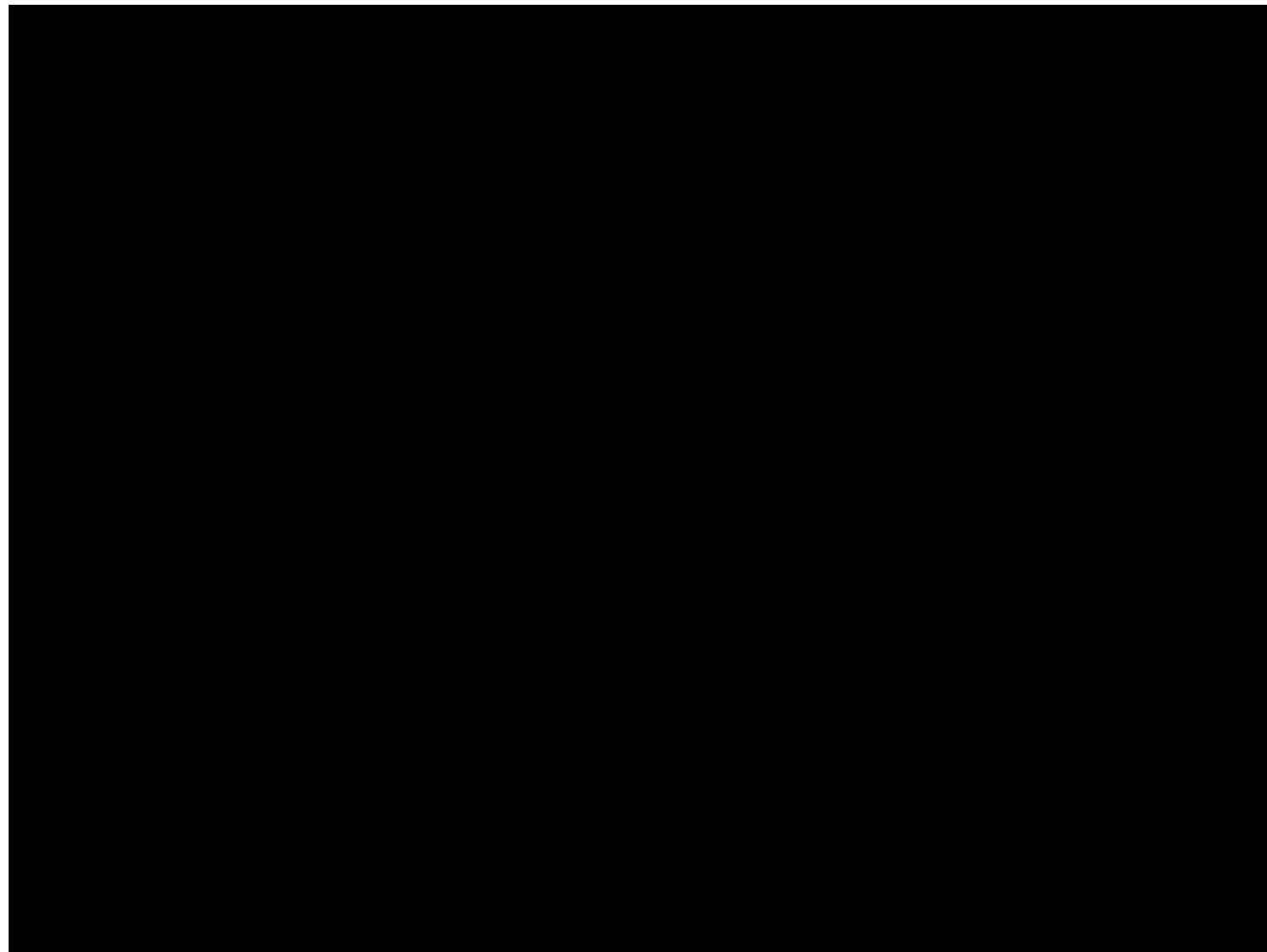
Applications

- Design to prevent failure.
- Make advances in biology happen and improve the life quality and longevity.
- Design better devices for energy to improve lifetime and endow desired properties like flexibility.
- Design shape-changing structures.

Plane fuselage



Morphing



Method

- Study of forces.
- Study of deformation.
- Application of laws relating the forces to the
~~motion~~ and deformation.
- (Body not in motion)

- Study materials in static conditions under **small deformations**.
- Different types of loads.
- First step: calculation of stresses and strains

