

Architectural Mechanics

Changwen MI, PhD

School of Civil Engineering

Southeast University

2 Sipailou Street, Nanjing, Jiangsu 210096

(phone) 025-83792248, (email) mi@seu.edu.cn

Outline

- 1. General Information**
- 2. About the Instructors**
- 3. Major Contents of the Course**
- 4. Conclusions**

Introduction

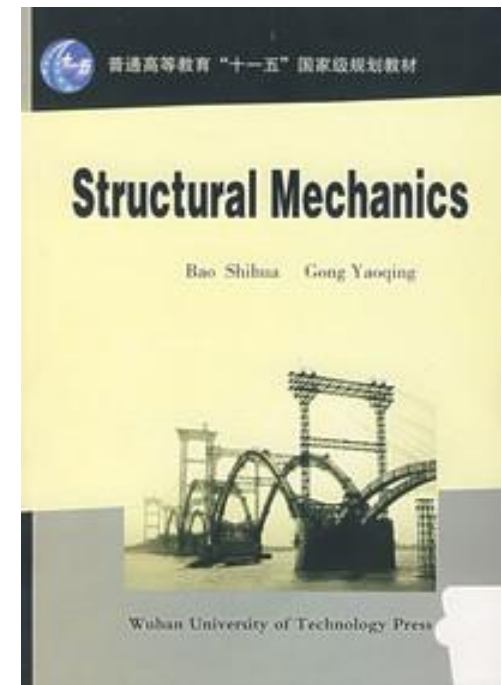
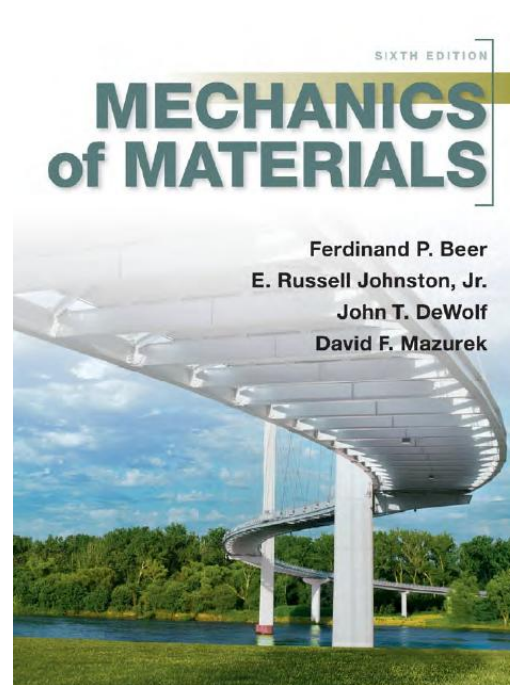
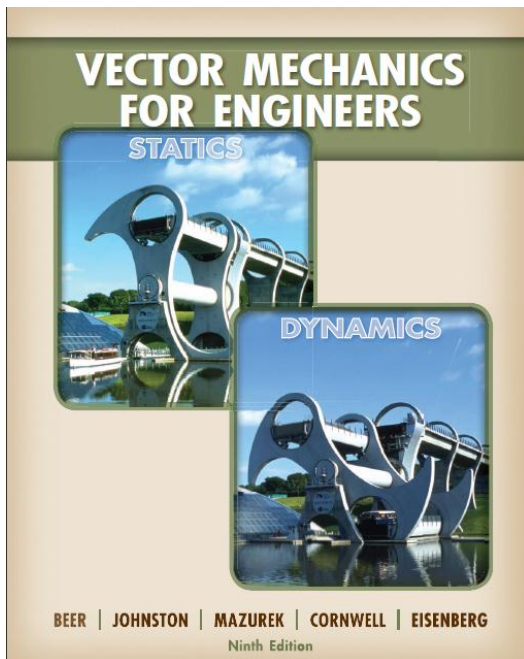
- **Audience:** undergraduate students with foreign nationalities majoring in *architecture*
- **Course history:** 6 years (2010-2016)
- **Instructors:** Profs. Changwen Mi, Baijian Wu and Xiaobao Li
- **Contact:** Changwen Mi, (phone) 13611568828, (email) mi@seu.edu.cn

Schedule as of Spring 2016 Semester

- **Organization:** 16 Classroom lectures
- **Meeting time:** Tuesday 08:50-11:25
- **Credits:** 3
- **Credit hours:** 48
- **Office hours:** Tuesday 14:00-16:30,
Thursday 09:00-11:30, or by appointment

References (Textbook not Required)

- Vector Mechanics for Engineers: Statics & Dynamics, F.P. Beer, E.R. Johnston and E.R. Eisenberg, 9th Ed., 2009, McGraw Hill.
- Mechanics of Materials, F.P. Beer, E.R. Johnston and J.T. Dewolf, 6th Ed., 2012, McGraw Hill.
- Structural Mechanics, S.H. Bao and Y.Q. Gong, Wuhan University of Technology Press, 2007.



Grading Policy

- Present work in a comprehensive, neat, and orderly fashion to receive full credit.
- Work must be turned in by the due date unless prior arrangements are made.
- The assignments are weighted as follows:

Assignment category	Percentage
Attendance, Homework, Quizzes	40%
Final exam	60%
Course total	100%

<http://civil.seu.edu.cn/mi/am/>

The image shows a web browser window with the address bar containing <http://civil.seu.edu.cn/mi/am/list.htm>. The browser's menu bar includes options like 文件(F), 编辑(E), 查看(V), 收藏夹(A), 工具(T), and 帮助(H). The page features a dark blue navigation bar with links: 首页, 课题组成员, 科研成果, 建筑力学, 材料力学, 固体力学基础, 弹性力学, and 力学实验. On the left, a vertical sidebar contains buttons for 课程概述, 主讲教师, 教学大纲, 授课教案, 授课视频, 习题, and 参考文献. The main content area displays the current location as 当前位置: >>首页 | 建筑力学. A large inset window shows a presentation slide titled "Quality Course Project – Southeast University" and "Architectural Mechanics" by Changwen MI, PhD, from the School of Civil Engineering at Southeast University. The slide also provides the address: Sipailou 2#, Civil Engr. Rm. #811, Nanjing, Jiangsu 210096, and contact information: (phone) 8379-2248, (email) mi@seu.edu.cn.

当前位置: >>首页 | 建筑力学

Quality Course Project – Southeast University

Architectural Mechanics

Changwen MI, PhD

School of Civil Engineering
Southeast University
Sipailou 2#, Civil Engr. Rm. #811
Nanjing, Jiangsu 210096
(phone) 8379-2248, (email) mi@seu.edu.cn

http://civil.seu.edu.cn/mi/experiment/



首页 课题组成员 科研成果 建筑力学 材料力学 固体力学基础 弹性力学 力学实验

实验概述

拉伸实验

常数测定

应变增强

剪切实验

扭转实验

弯曲正应力

压缩与失稳

参考文献

当前位置: >>首页 | 力学实验

Introction to this webpage

Strength of Materials, often termed also as Mechanics of Materials, is generally the name applied to a discipline in which the stress, strain and deflections of loaded structural elements are considered. To be more specific, it is the physical science that examines the distribution of internal forces of a solid body, typically a prismatic bar, due to mechanical and thermal loads and the body's reaction to deformation.

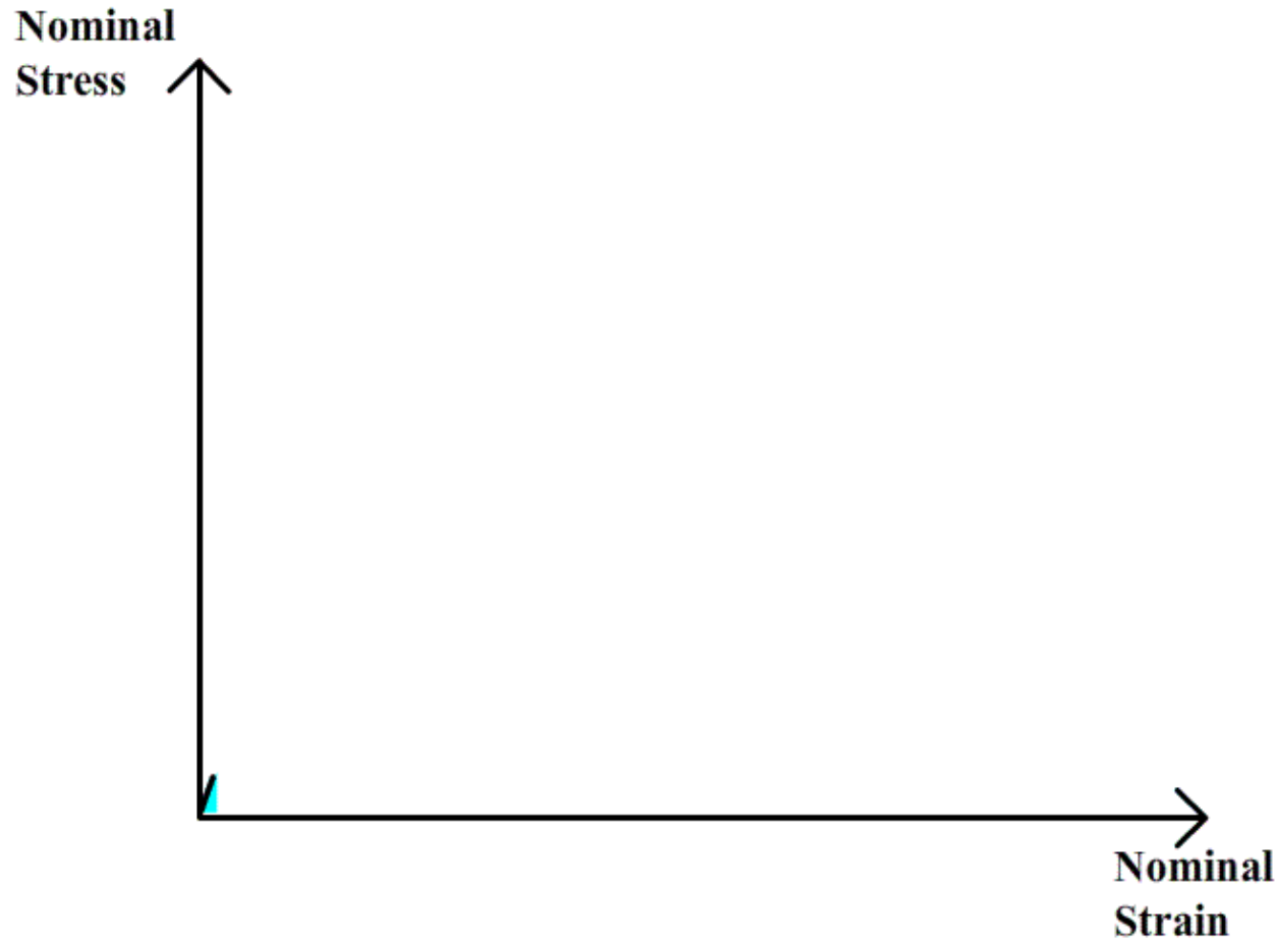
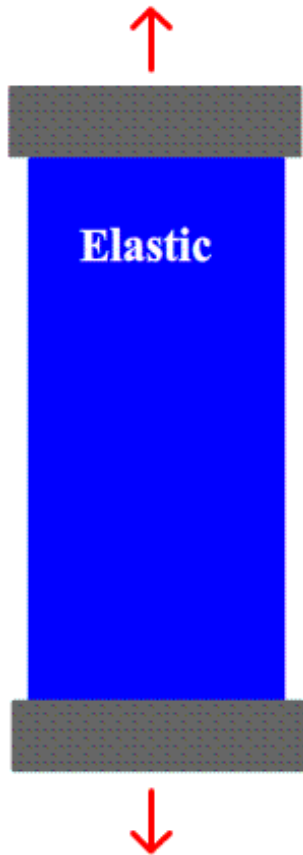
This Strength of Materials Virtual Laboratory presents the laboratory aspects of this subject, in an imaginary way. It is intended to give an experimental understanding and verification of the coursework covered in Strength of Materials. Students will have the opportunity to review the theory, appreciate the fundamental hypotheses and clarify the deformation modes of a prismatic bar by watching animated pictures. Animations present experimental tests on different materials in tension, compression, torsion, bending, shear, buckling, and some combinations of them. By watching the provided tests, students get a near-realistic feel of the experiment, which in turn help them to understand the theory, and compare the experimental results with handbook values. A short quiz is provided at the end of the each lab to test the understanding of students, followed by a list of further reading topics on the subject matter.

However, it should always be kept in mind that this virtual laboratory is not intended to replace the real experiments. It is designed to give those who have difficulty to access real experiments a simulated experimental environment. Naturally, many factors such as the operation of equipment and discussion of unexpected results cannot be reflected.

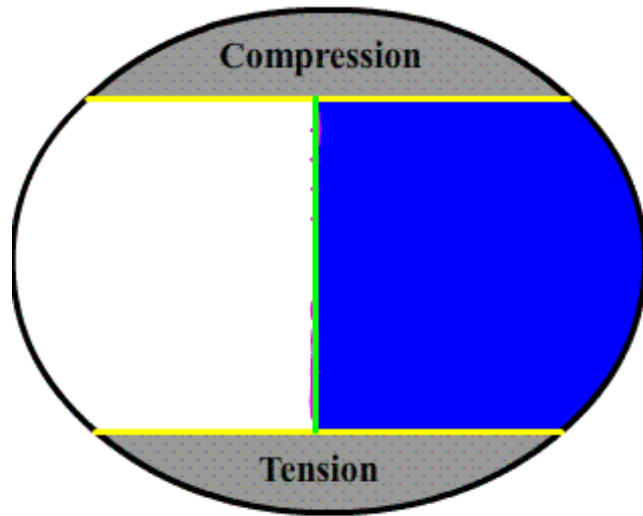
Mechanical Testing

Because of the need to compare measured properties and performance on a common basis, users and producers of engineering materials use standardized test methods such as those developed by ASTM and ISO. These standards prescribe the method by which the test specimen will be prepared and tested, as well as how the test results will be analyzed and reported.

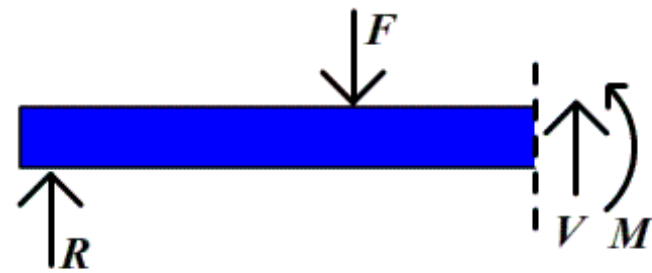
**Stress-Strain Diagram for a Typical Ductile Material
(Not to Scale)**



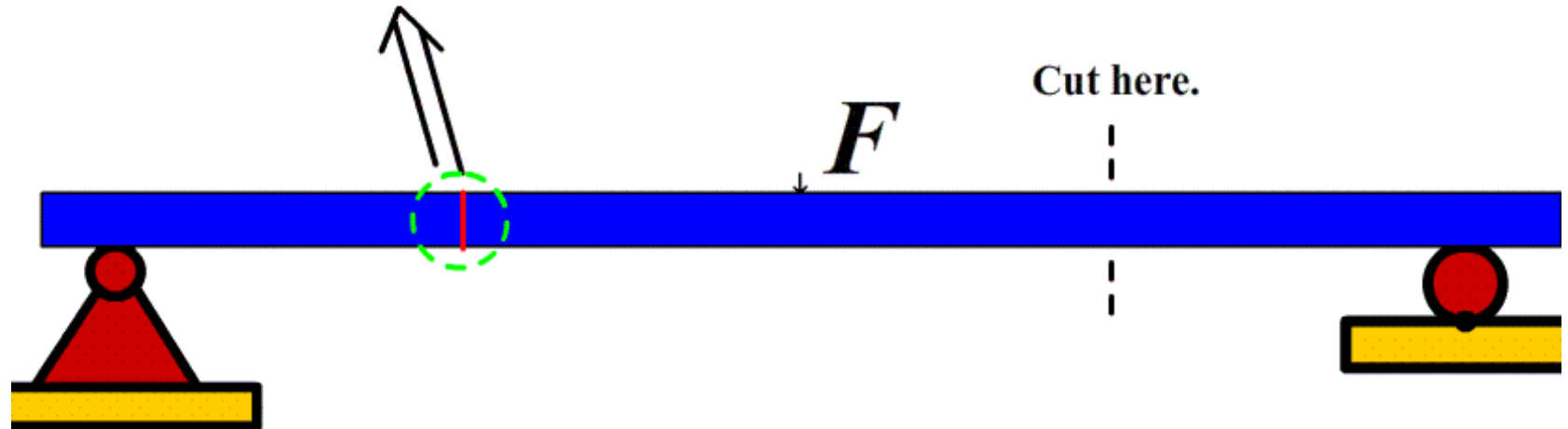
Transverse Bending of a Simply Supported Beam



Enlarged View of Bending Stresses



Free Body Diagram (Left)



Instructors

□ Changwen Mi

- **Associate professor of solid mechanics**
- **Advisers of PhD and Master students**
- **Research area: Interface and surface mechanics; Physical mechanics; Micromechanics and nanomechanics; Stress corrosion cracking**
- **Courses: Architectural mechanics; Strength of materials; Theory of elasticity; Theory of plasticity**
- **Primary investigators of a number of scientific and teaching research funds**
- **Author of more than 20 scientific papers**



Instructors

□ Baijian Wu

- **Assistant professor of engineering mechanics**
- **Research area: Structural health monitoring; Biomechanics; Multiscale modeling of structural damage**
- **Courses: Theoretical mechanics; Architectural mechanics**
- **Author of more than 10 scientific papers**



Instructors

□ Xiaobao Li

- **Professor of solid mechanics**
- **Research area: Computational mechanics; Computational materials science; Nanocapacitor; Mech-electro-magnetic coupling; Micromechanics and nanomechanics**
- **Courses: Strength of materials; Architectural mechanics**
- **Primary investigators of a number of scientific research funds**
- **Published papers in JMPS, Nature communications, Soft matter, Physical chemistry and chemical physics**



Topics Covered in the Course

- Mechanics is a physical science, since it deals with the study of physical phenomena.
- Mechanics is the foundation of most engineering sciences and is an indispensable prerequisite to their study.
- Mechanics is an applied science. The purpose of mechanics is to explain and predict physical phenomena and thus to lay the foundations for engineering applications.

Topics Covered in the Course

Statics, Mechanics of Materials and Structural Mechanics
are parts of
the Architectural Mechanics

**Architectural Mechanics is to analyze the
response of rest bodies and structures to forces.**

Statics: The Analysis of Bodies at Rest

Dynamics: The Analysis of Bodies in Motion

**Mechanics of Materials: The Analysis of Deformable
Bodies**

**Structural Mechanics: The Analysis of Deformable
Structures, often are statically indeterminate**

Topics Covered in the Course

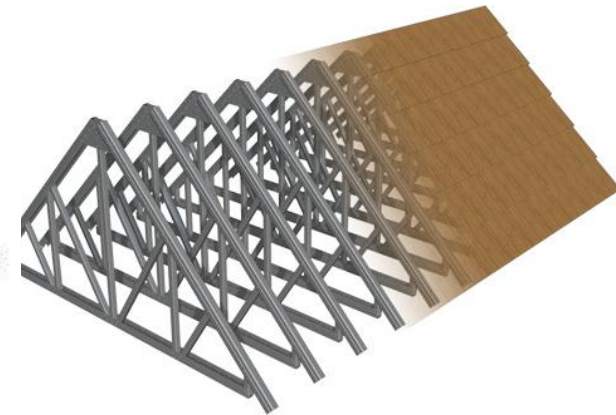
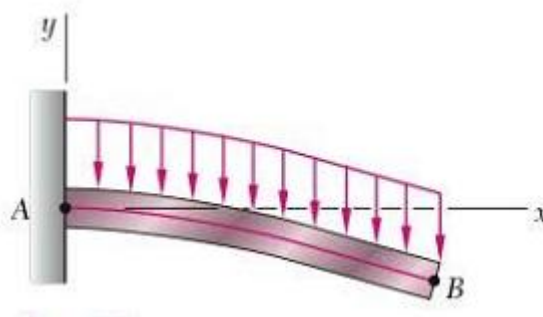
Then, what is the **Body** anyway?

(1) Particle: Point Mass

(2) Rigid Body: Mass + Volume, but No Deformation

(3) Deformable Body: Mass + Volume + Deformation

(4) Deformable Structure: Structure + Deformation



Mass Points

Rigid Bodies

Deformable Solids

Deformable Roof Trusses

Topics Covered in the Course

- Introduction to architectural mechanics
- Statics of particles
- Rigid bodies: equivalent systems of forces
- Equilibrium of rigid bodies
- Internal forces of determinate structures
- Axial loading of prismatic bars; concept of stresses & strains
- Shearing & Bearing
- Torsion of circular shafts

Topics Covered in the Course

- Torsion of circular shafts
- Bending internal forces & stresses
- Bending deflections
- Stress states and strength theory
- Combined loading
- Column buckling
- Energy methods

Topics Covered in the Course

- Force Method
- Displacement of determinate structures
- Internal forces of statically indeterminate structures
- Influence line

Conclusions

- “Architectural mechanics” has been successfully taught for 6 years.
- Audience are all undergraduate students with foreign nationalities majoring in architecture.
- Rich experience in English teaching and excellent expertise in subject matter.
- Specialized course website for instructor-student communication.



Thank you!