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

Outline

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

Introduction

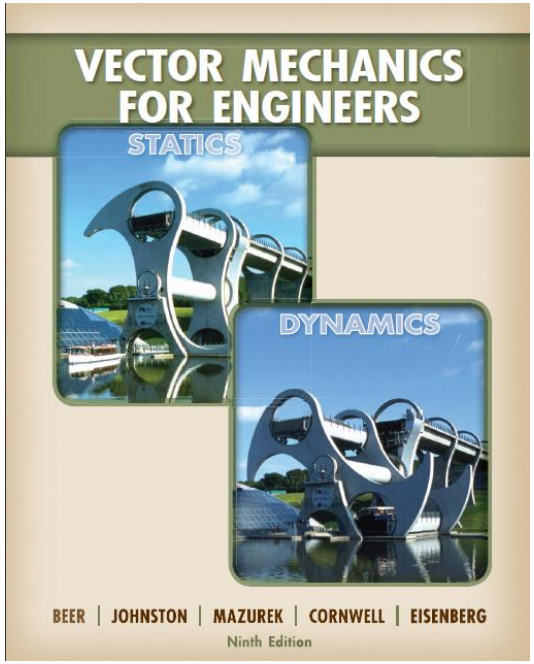
- **Audience:** undergraduate students with foreign nationalities majoring in *architecture*
- **Course history**: 6 years **(**2010-2016)
- **Instructors:** Profs. Changwen Mi, Baijian Wu and Xiaobao Li
- **Contact:** Changwen Mi, (phone) 13611568828, (email) mi@seu.edu.cn

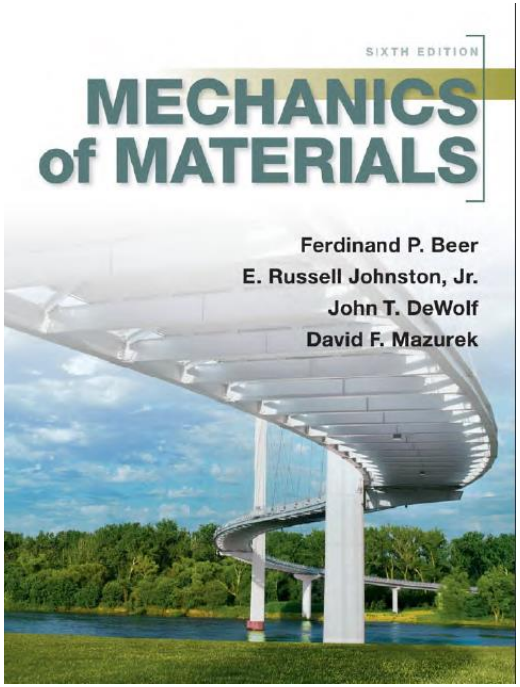
Schedule as of Spring 2016 Semester

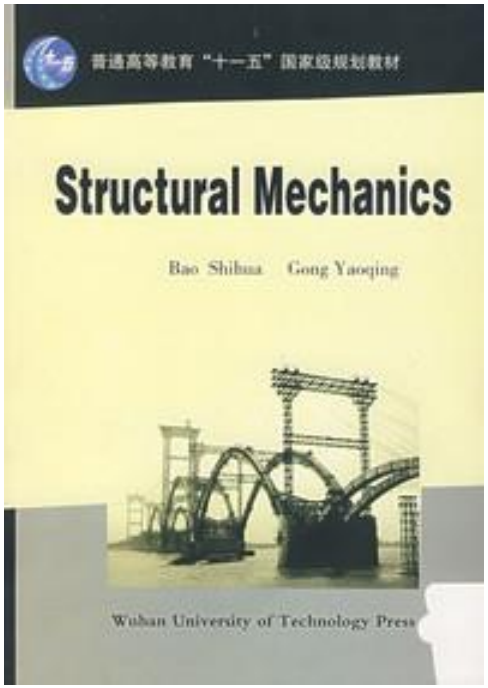
- **Organization:** 16 Classroom lectures
- **Meeting time:** Tuesday 08:50-11:25
- **Credits:** 3
- **Credit hours:** 48
- **Office hours:** Tuesday 14:00-16:30, Thursday 09:00-11:30, or by appointment

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

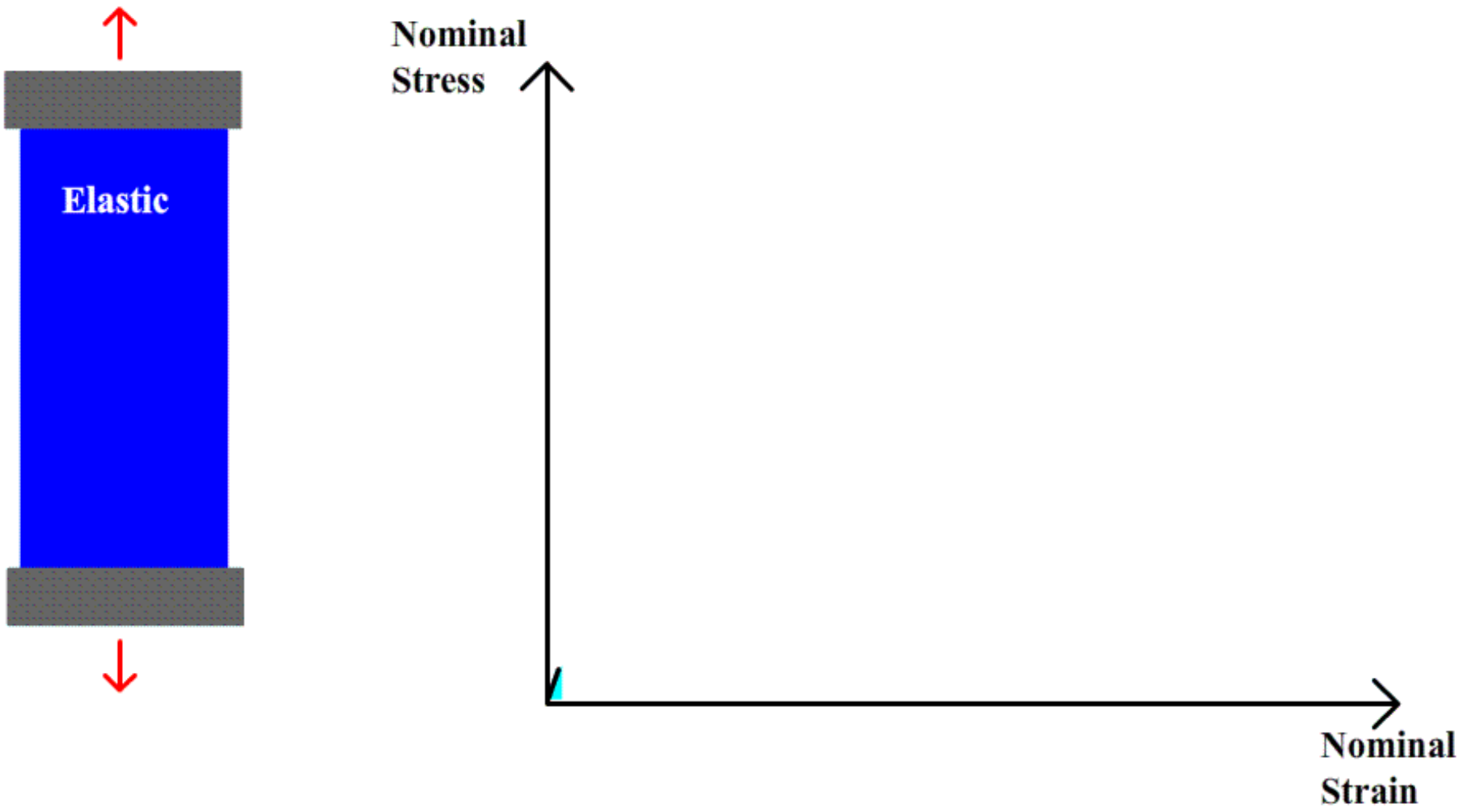
- Present work in a comprehensive, neat, and orderly fashion to receive full credit.
- Work must be turned in by the due date unless prior arrangements are made.
- The assignments are weighted as follows:

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

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

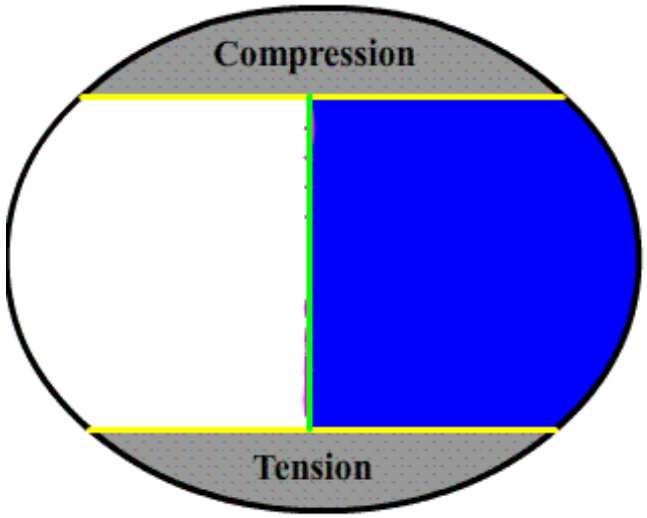
http://civil.seu.edu.cn/mi/experiment/

Course Website: *http://em2lab.yolasite.com*

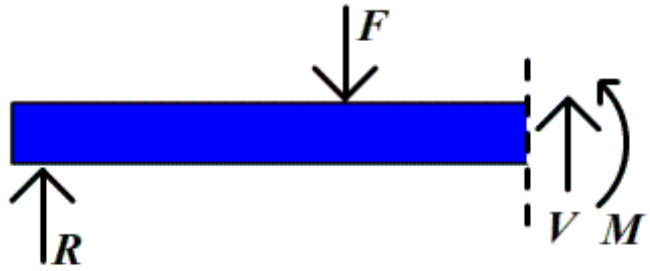


Course Website: *http://em2lab.yolasite.com*

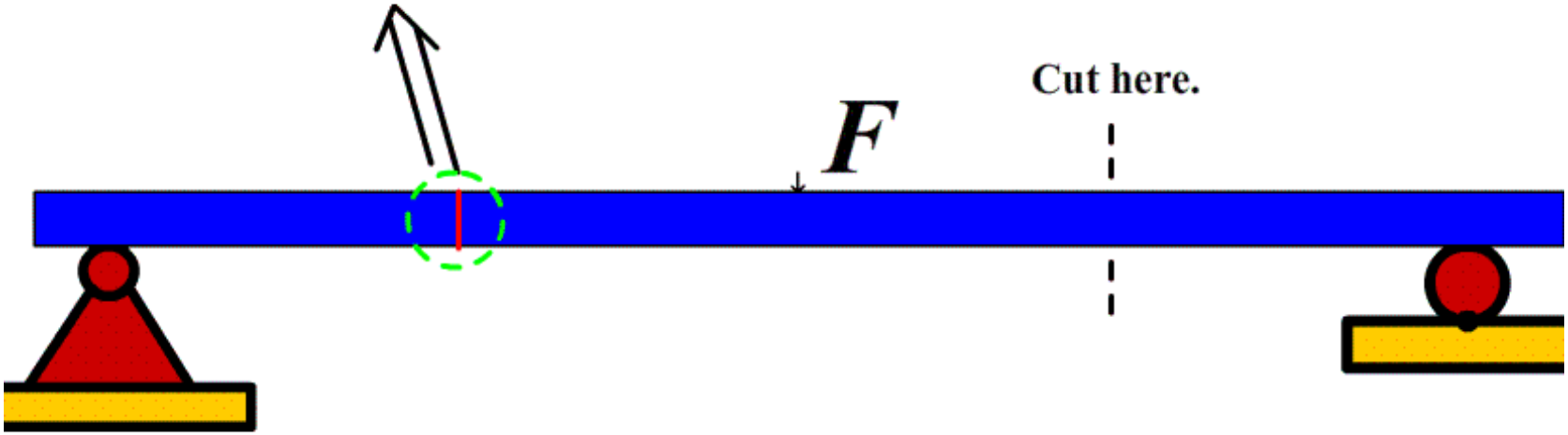
Transverse Bending of a Simply Supported Beam



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

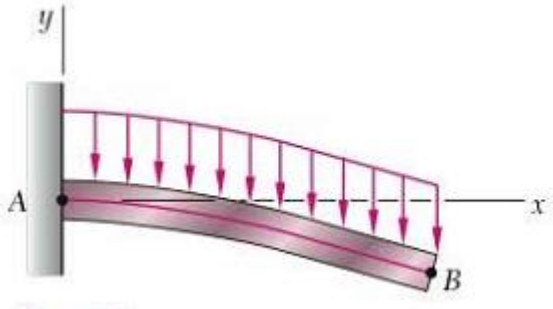
(2) Rigid Body: Mass + Volume, but No Deformation

(3) Deformable Body: Mass + Volume + Deformation

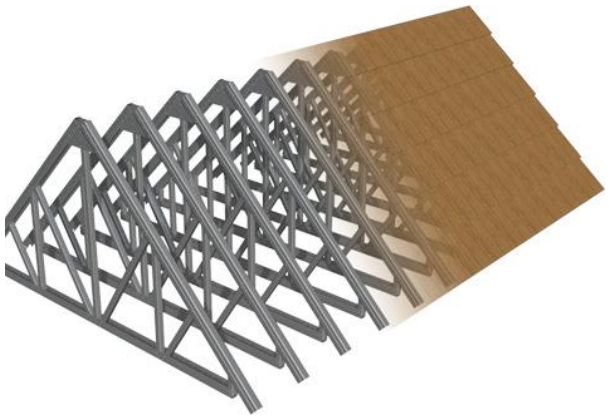
(4) Deformable Structure: Structure + Deformation

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!