BME 670 Introduction to Biomechanical Engineering

CLASS HOURS: TUES. 6:00 – 9:05 PM, 698 FENSTER HALL

OFFICE HOURS: TUES. 3:00 - 5:00 PM, 435 COLTON HALL

Or by appointment: **vanbuskirk@njit.edu**

TEXTS

Stephen C. Cowin and Stephen B. Doty, *Tissue Mechanics*, Springer, 2007. ISBN-10: 0-387-36825-6 ands ISBN-13 978-0-387-36825-2.
C. Ross Ethier and Craig A. Simmons, *Introductory Biomechanics: From Cells to Organisms*. Cambridge University Press, 2007. ISBN-13 978-0-521-84112-2.

PREREQUISITES BY TOPIC

1. Vector calculus.
2. Statics.
3. Dynamics.
4. Mechanics of materials.
5. Fluid mechanics.

COURSE DESCRIPTION

Tensor analysis. Kinematics of continuous media. Stress. The elastic solid. Newtonian viscous fluid. Conservation principles of mass, momentum, and energy. Formulation of constitutive equations. Non-Newtonian fluids. Applications to the modeling of bone, soft tissue, blood and other biological fluids.

COURSE TOPICS

1. Tensors. (2 classes)
2. The stress tensor. (1 class)
3. Kinematics of deformation and flow. (2 classes)
4. Generalized Hooke's law. (1 class)
5. Bone as an example of an anisotropic material. (1 class)
6. Elastostatics and elastodynamics. (2 classes)
7. The Newtonian fluid. The Navier-Stokes equation. (2 classes)
8. Non-Newtonian fluids. (1 class)
9. Blood flow and pulse propagation. (1 class)
10. Mid-term. (1 class—Oct. 16)

HOMEWORK IS DUE ONE WEEK AFTER IT IS ASSIGNED – TO BE HANDED IN BEFORE LECTURE.

GRADING: HOMEWORK 25%, MID-TERM 25%, FINAL EXAM 50%

The NJIT Honor Code will be upheld. Any violations will be brought to the immediate attention of the Dean of Students. Deviations from this syllabus will be discussed with the students.