SYLLABUS: BMEN 231 FOUNDATIONS OF BIOMECHANICS
Fall 2011 (TR 12:45pm-2:00pm, ETB 1037)

Course Description:
The main goal of this course is to bridge between physical and biological worlds. It explores how mechanical forces and more generally laws of physics manifest and impose constraints on the design of biological systems. Emphasis on quantitative application of physical concepts to biology. Examples cover the effect of mechanical forces on the formation/evolution of shapes, habits, and materials of organisms.

Prerequisites:
Freshman-level physics and calculus

Course Objective:
Gain knowledge of mechanics and develop ability to apply it to biological phenomena.

Instructor: Wonmuk Hwang, Ph.D.
Room: ETED 5060
Email: hwm@tamu.edu
Tel: 458-0178
Office hours: To be determined during the first day of class.

Textbook:

Grader: Xiaojing Teng
Room: ETED 2030
Email: tengxj1025@neo.tamu.edu

Grading:
Midterm 35%
Final 35%
Homework & Participation 30%

Course Outline (27 lectures in total):

1. (8/30) Intro & Motivational example: Gaits and inflation of artery
2. (9/1) Review of classical mechanics
3. (9/6) Conservation laws, size & scale in biology
4. (9/8) Hydrostatics: pressure & buoyancy
5. (9/13) Surface tension
6. (9/15) Contact angle of a liquid on substrate
7. (9/20) Meniscus and Capillary rise
8. (9/22) Hydrodynamics: Equation of continuity
9. (9/27) Bernoulli’s equation
10. (9/29) Review for midterm
11. (10/4,6) Study period for midterm (no class)
12. (10/11) Midterm Exam
13. (10/13) No class (BMES Meeting)
14. (10/18) Midterm solver; Description of fluid motion using partial derivatives
15. (10/20) Partial Derivative example
16. (10/25) Viscosity
17. (10/27) Hagen-Poiseuille flow
18. (11/1) Circulatory system
19. (11/3) Linear elasticity of solids: Young’s modulus and Poisson’s ratio
20. (11/8) Shear stress
21. (11/10) Torsion
22. (11/15) Properties of biological materials
23. (11/17) Beam bending and buckling
24. (11/22) Viscoelasticity
25. (11/29) Molecular transport processes: Diffusion vs. convection
26. (12/1) Random walk picture of diffusion
27. (12/6) Course Overview

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity
For additional information please visit: http://www.tamu.edu/aggiehonor
“An Aggie does not lie, cheat, or steal, or tolerate those who do.”