Course: Advanced Topics in Biomechanics (AME 90974)  
Control #: 25496

Meeting Time: Tuesday and Thursday 2:00 – 3:15  
Meeting Place: DeBartolo 210

Instructor:  
Glen L. Niebur  
376 Fitzpatrick Hall  
631-3327  
gniebur@nd.edu  
Office Hours: Mon. and Th. 3:15 – 5:00, by appointment, or when my door is open.

Other information: http://bones.ame.nd.edu/ame974

Prerequisites:  
- Continuum Mechanics (or Elasticity or Plasticity or Advanced Mechanics of Solids or Permission of Instructor)

Objectives:  
- To understand and apply continuum theories to biological materials.

Text: Course notes available at bookstore

Supplemental Texts  
Gurtin, M.E.: *Tensor Calculus*  
Taber, L.: *Nonlinear theory of elasticity : applications to biomechanics*  
Mow, V and Huiskes, R: *Basic Orthopaedic Biomechanics*

Grading:  
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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Homework</td>
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<tr>
<td>Final Exam</td>
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<td>Final Project</td>
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Examinations:  
There will be one exam at the schedule final examination time

Topics  
I. Review of tensor calculus, continuum mechanics  
II. Thermomechanics  
   1. Balance of energy  
   2. Hyperelastic materials/Strain energy functions  
      The Green, Nahgdi, Rivlin Theorem  
III. Bone  
   1. Irreversible processes
2. Damage mechanics

IV. Tendons and ligaments
   1. Finite elasticity
      Single Integral Finite Strain elasticity
   2. Constrained materials
      Incompressibility
      Fiber reinforced models

V. Cartilage
   1. Mixture theory
   2. Biphasic theory
   3. Triphasic theory
   4. Fiber reinforced models