ME 456 COURSE PROFILE

DEGREE PROGRAM: Mechanical Engineering

COURSE NUMBER: ME 456	**COURSE TITLE:** Tissue Mechanics
REQUIRED COURSE OR ELECTIVE COURSE: Elective	**TERMS OFFERED:** Winter
TEXTBOOK / REQUIRED MATERIAL: Web-based notes provided by Instructor	**PRE / CO-REQUISITES:** MECHENG 211, MECHENG 240. II (3 credits)
COGNIZANT FACULTY: S. Hollister	**COURSE TOPICS:** 1. Continuum Mechanics Review 2. Weak Formulation for Mechanics Problems 3. Finite Element Analysis for Biological Tissues 4. Hierarhical Homogenization Theory for Tissue Mechanics 5. Mechanical Theories of Hard Tissue Adaptation 6. Mechanical Theories of Soft Tissue Adaptation and Growth 7. Mechanics Applications to Tissue Engineering
BULLETIN DESCRIPTION: Definition of biological tissue and orthopaedic device mechanics including elastic, viscoelastic and non-linear elastic behavior. Emphasis on structure function relationships. Overview of tissue adaptation and the interaction between tissue mechanics and physiology.	
COURSE STRUCTURE/SCHEDULE:	

COURSE OBJECTIVES: **for each course objective, links to the Program Outcomes are identified in brackets.**	1. Teach students basic ideas of the weak formulation for mechanics [1, 2, 6]. 2. Teach students hands-on approachesto finite element modeling of biological tissues [1, 2, 6]. 3. Teach students concepts of scale hierarchy in tissues and the use of homogenization theory for multiscale modeling [1, 2, 6]. 4. Teach students mechanical theories of tissue adaptation and growth [1, 2, 6]. 5. Teach students how to apply mechanics and modeling in design of tissue engineering systems [1, 2, 6]
COURSE OUTCOMES: **for each course outcome, links to the Course Objectives are identified in brackets.**	1. Learn how to derive weak formulations for mechanics problems [1]. 2. Understand theory of finite element modeling [2]. 3. Learn how to use software for finite element modeling of biologic tissues [2] 4. Learn how to formulate multiscale approaches for tissue mechanics problems and solve these problems numerically [3] 5. Learn physiologic basis and mechanical theories of how tissues adapt and grow [4,5]. 6. See how modeling and mechanics may be applied to tissue engineering problems [5].
ASSESSMENT TOOLS: **for each assessment tool, links to the course outcomes are identified**	1. Class project on computational modeling [1-6]. 2. Written final exam [1-6]. 3. End of term course evaluations by each student [1-6].

PREPARED BY: R. Coleman
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