

Syllabus of MEC 456/556 : Introduction to Engineering Mechanics of Composites, Fall 2016

Time: Tuesday 4pm-7pm

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Office hours: Tuesday 1pm-3pm,

Test Books: Engineering Mechanics of Composite Materials. Isaac M. Daniel and Ori Ishai. Oxford university press, 2005

Grading: Homework (10%), Midterm 1 (25%) on Sep 20, Midterm 2 (25%) on Nov 15, Final exam (40%) (Final exam week)

Introduction: Introduction to the engineering mechanics of fiber reinforced composites. Brief history of the development of fiber composites, their properties, advantages, limitations and applications. Overview of the different types of composites but with focus on long fiber reinforced composites; particularly, lamina and laminate concepts, characteristics and configurations. Topics covered include: elastic properties of unidirectional lamina, strength of unidirectional lamina, elastic behavior of multidirectional laminates and stress and failure of multidirectional laminates. Design methodologies and considerations for structural composite materials

COURSE LEARNING OBJECTIVES

1. Become familiar with the advantages and limitation of fiber composites in comparison with conventional structural materials
2. Ability of using stress-strain linear elastic constitutive relations in structural analysis, including Isotropic, Anisotropic, Orthotropic and transverse isotropic relations
3. Knowledge of coordinate transformation of stress, strain, stiffness and compliance matrices
4. Knowledge of theoretical methods for predicting effective elastic properties using rule of mixture, Halpin-Tsai formulation, including advantages and limitations
5. Ability to determine the onset of failure in composites using maximum stress theory, maximum strain theory, Tasi-Hill and Tsai-wu theories
6. Ability to determine the elastic behavior of multidirectional laminates composed of plies with different orientations

Course outline:

- 1: Introduction to composites
- 2: Basic Concepts, materials, processes, and characteristics
- 3: Elastic behavior of composite-micromechanics
- 4: Elastic behavior of composite-Macromechanics
- 5: Strength of unidirectional lamina - Micromechanics
- 6: Strength of unidirectional lamina - Macromechanics
- 7: Elastic behavior of multidirectional laminates
- 8: Stress and Failure analysis of multidirectional laminates

DISABILITY SUPPORT SERVICES (DSS) STATEMENT (must be the following language)

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room 128, [\(631\) 632-6748](tel:6316326748). They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

[In addition, this statement on emergency evacuation is often included, but not required:

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>]

ACADEMIC INTEGRITY STATEMENT (must be the following language as approved by the undergrad council):

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

CRITICAL INCIDENT MANAGEMENT (must be the following language as approved by the undergrad council):

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or

inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.