ME 6204 – Micromechanics of Materials

Fall 2018
Tue: 11:00 AM-12:30 PM / Thu: 11:00 AM-12:30 PM

Credit: 3-0-3 (3 credits, 3 hours per week)

Prerequisites: Graduate standing: Principles of Continuum Mechanics (ME6201) or equivalent, Mechanics of Deformable Bodies (COE3001) or equivalent

Instructor: Dr. Stephane Berbenni
Office: 100, Level 1 - GTL
Tel.: +33 (0) 3 8720 3938
Email: stephane.berbenni@georgiatech-metz.fr

Office Hours: Tue 9:30 AM-11:00 AM / Thu 9:30 AM-11:00 AM (or by appointment)


Other reference textbooks:

Objectives: This class will introduce the unified theories of micromechanics of solids:
- To study the microstructure of materials in the context of continuum theories of mechanics.
- To develop methods for predicting the mechanical behavior of composite materials

Topics:
• Introduction of micromechanics of solids, motivation and examples (2 weeks)
• Review of the continuum mechanics field equations for micromechanics, General theory of eigenstrains (2 weeks)
• General solutions, Green’s function method, Fourier Transform representation, Lippmann-Schwinger equation for micro-heterogenous elasticity with eigenstrains (2 weeks)
• Eshelby’s inclusion problem, inhomogeneity problem, Equivalent Inclusion Method (2 weeks)
• Effective properties of heterogeneous materials, average theorems, Hill’s lemma (2 weeks)
• Voigt, Reuss approximations (1 week)
• Different homogenization schemes for heterogeneous elastic materials: Eshelby scheme, Mori-Tanaka scheme, Self-Consistent scheme, Hashin-Shtrikmann estimates, Generalized self-consistent scheme (3 weeks).

Assignments: Homework assignments will be graded and the solutions will be handed out. No late assignments will be accepted (except acceptable reason). All class handouts will be given in class, and, will be available in Dr Berbenni’s office.

Evaluation: 30% Homework
30% Mid-term
40% Final Exam

Grading Scale: Your final grade will be assigned as a letter grade according to the following scale:
A 90-100%
B 80-89%
C 70-79%
D 60-69%
F 0-59%

Important dates: First class day: to be defined (introductive lecture)
Mid-term examination (1.5 hours): to be defined before drop day
Recess week: to be defined
Final instructional class day: to be defined
Final examination (3 hours): to be defined. The final date will be announced during the semester at least 2 weeks in advance.

Academic Integrity: Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech’s Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Student-Faculty Expectations Agreement: At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.