AA535/ME500 Advanced Composite Structural Analysis

Instructor: Prof. Mark Tuttle
MEB Rm 210
(206)543-5710
tuttle@u.washington.edu

Office hrs: MWF, 2:30-3:20pm Office hrs: T, Th, 1:30-3PM

Class Schedule: MWF: 1:30-2:20pm, Loew Hall Rm 206

Prerequisites: ME450 or AA532 (or equivalent), or permission of instructor

Course Web Site: http://courses.washington.edu/mengr500/

Course Textbook: M. E. Tuttle, *Structural Analysis of Polymeric Composite Materials*, 2nd edition, CRC Press/Taylor and Francis Group (2013).

Topics Covered (Subject to Change!):

- Brief Review:
  - Hooke's Law for anisotropic materials (e.g., the $[S]$, $[\overline{S}]$, $[Q]$, and $[\overline{Q}]$ matrices)
  - Classical lamination theory (e.g., the $[ABD]$ and $[abd]$ matrices)
  - Macromechanical failure theories

- Composite beams:
  - Effective axial & bending stiffnesses of composite beams w/various cross-sections
  - Comparisons with finite-element predictions

- Stress/strain concentrations near elliptical holes
  - The Savin solution
  - Elliptical and circular holes in unidirectional and multiangle laminates
  - Comparisons with finite-element predictions
  - Point-stress failure theories

- Deflections of transversely-loaded orthotropic plates:
  - Governing equations of thin plates
  - Exact solutions for simply-supported specially orthotropic plates
  - Approximate solutions for simply-supported generally orthotropic plates (Rayleigh-Ritz analyses)
  - Comparisons with finite-element predictions

- Buckling
  - Thermal buckling of cross-ply laminates with free-edges (the Hyer solution)
  - Thermo-mechanical buckling of simply-supported laminates

Grading Policy:

Homework:	30%
Midterm Exam:	35%
Final Exam:	35%