**AE 7791: Damage, Failure and Durability of Composite Materials**

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| Credit Hours: | 3-0-3 |
| Prerequisites: | AE 4791 or CHE 4791 or CEE 4791 or MSE 4791 or ME 4791 or equivalent |
| Catalog Description: | Analysis and failure of fiber reinforced composite material systems. Mechanisms of toughening, multiple cracking mechanisms. Failure in woven fabric, braided and special geometry composites. Crosslisted with ME, CHE, CEE, MSE, and PTFE 7791. |
| Textbooks: | None; Handout notes and papers |
| Topics: | 1. Introduction. Definitions. Fracture mechanics vs. Damage mechanics. 2. Multiple matrix cracking. Aveston-Cooper-Kelly Analysis. Shear-lag analysis. Assessment of experimental data. 3. Transverse ply cracking in laminates. Shear-lag analysis. Variational analysis. Damage evolution and moduli changes. Numerical and statistical methods. Assessment of experimental data. 4. Limitations of micromechanics. Continuum damage mechanics. Damage characterization by scalars, vectors and tensors. Stiffness-damage relationships. Damage evolution. Assessment of experimental data. 5. Fatigue damage mechanisms. Fatigue life diagrams. Modeling of damage evolution and stiffness and strength degradation. Matrix toughness and fiber architecture effects. 6. Failure in tension and compression. Mechanisms and models. Effects of notches. Non-destructive evaluation of damage. Design aspects. |
| Evaluation: | Term papers. |