

Course: MAE 496 Senior Thesis or MAE 495 Independent Study

Proposed Topic #2: **Properties of fabric-reinforced polymer composites under fire**

Advisor: Ever Barbero

Term: Fall 2011 or later

Standing: Senior AE/ME/MSE or equivalent

Pre/co-requisites: Mechanics of composite materials and Fortran

The project consists of developing an algorithm (micro-mechanics) and extending an existing computer program [1] to predict the through-thickness coefficient of thermal conductivity (CTE), specific heat (Cp), elastic modulus (Ex), mass loss, and pyrolysis of fabric-reinforced composites under fire, as a function of temperature (T). The student will be provided with an existing code that describes the geometry of the fabric-reinforced composite and personal tutoring on how this code can be modified to compute the quantities of interest. Proficiency in computer programming is essential. The student will have to study micro-mechanics, starting with Chapter 4 in [2] and related topics. The student needs to make predictions and compare them with available experimental data. Some experimental data will be supplied to the student; additional data may have to be gathered by the student as needed [3]. Some of the parameters required by the program may not be available with the experimental data. Often the missing parameters are available someplace else in a format that needs to be interpreted, analyzed and transformed to the needs of the algorithm. Sometimes, the data set will have to be completed using data from similar materials, which requires a fair amount of judgment, understanding, and strong ethical conviction on part of the student to guide his/her judgment. The student must be willing to search the literature for additional data, conduct numerical/parametric studies and use judgment to evaluate the influence of input data and so on. The expected deliverable is a report in the format of a journal paper. The advisor will attempt to publish it in a major journal with the student as co-author provided the manuscript is accepted without major additional work.

[1]

[2]

[3]