

16.901: Homework # 13  
Due Date: April 27, 2pm

This homework builds upon the Monte Carlo method for the 1-D blade heat transfer problem that you developed in Homework #12 in which the thickness of the thermal barrier coating (TBC) is assumed to have a triangular distribution. The goal is to implement an error estimate for the mean value of  $T_{mh}$  and use it as a means to terminate the Monte Carlo simulation (i.e. set the sample size).

1. Using an error estimate, modify the Monte Carlo method so that the mean value of  $T_{mh}$  is calculated within an arbitrary accuracy at 99% confidence level. Attach a hard copy of your modified Matlab script.
2. Assume that  $L_{TBC_{\min}} = 0.00025m$ ,  $L_{TBC_{mpp}} = 0.0003m$ , and  $L_{TBC_{\max}} = 0.00075m$ . Using the modified script, what sample size was required to estimate  $T_{mh}$  within 10K, 1K, and 0.1K? For each of these three Monte Carlo simulations, state the 99% confidence ranges (i.e. there will be three confidence ranges, one for 10K, one for 1K, and one for 0.1K accuracy).