ME 536

Homework 3 (Due 2/18)

Note this homework will be part of a future project

(a) Using an available software (such as HPFLAME), plot T and Y_i (mixture composition) as a function of equivalence ratio (ϕ). For ϕ >2.0, assume frozen chemistry and adiabatic mixing, i.e., the mixture corresponding to ϕ >2.0 is adiabatically mixed with that obtained at ϕ =2.0. You can use either hydrogen-air or propane-air mixture.

(b) Plot T and Y_i versus the mixture fraction f.

Homework 4 (Due 3/4)

- One of the traditional approach to analyze turbulent flows employs the Reynolds-averaged Navier Stokes equations, which describe the time- or ensemble-averaged flow behavior. Using Reynolds decomposition, obtain these equations for a constant-density axisymmetric jet flow in the following form:

$$\frac{\partial \bar{v}_x}{\partial x} + \frac{1}{r}\frac{\partial (r\bar{v}_r)}{\partial r} = 0$$

$$\rho\left[\bar{v}_x\frac{\partial \bar{v}_x}{\partial x} + \bar{v}_r\frac{\partial \bar{v}_x}{\partial r}\right] = \frac{\mu}{r}\frac{\partial}{\partial r}\left(r\frac{\partial \bar{v}_x}{\partial r}\right) - \frac{1}{r}\frac{\partial}{\partial r}\left(r\rho\overline{v_r' v_x'}\right)$$