**AE/ME 6765, Fall 2022**

**Computer project**

**Due on Monday, November 28 by 9AM**

This project focuses on the rate of production of NO in a hydrogen-air flame. Calculate the composition and adiabatic flame temperature of the products of such a flame. Vary the equivalence ratio between 0.7 and 1.3 in steps of 0.1. Assume that the fuel and air enter the combustor at 298K and 500K respectively. The flame burns at 20 atm. Assume that the only products available in measurable quantities are: H2, O2, N2, H2O, OH, O, H & NO. Repeat the calculation for a stoichiometric mixture at 10 atm. and 2 atm. to investigate the effect of pressure. Finally, carry out the calculation with a stoichiometric hydrogen-air mixture at 20 atm., but add enough Ne to lower the flame temperature to that you found for a pure hydrogen-air flame at an equivalence ratio of 0.8.

Compare NO concentrations and comment for all cases described above. Also, compare the temperature and product composition with values found in the literature or obtained using a commercial program such as GasEq.

Do not assume the gases are calorically perfect and do not use an average value for the specific heats.

***Submit:***

1. Title page
2. Introduction (one paragraph)
3. Description of methodology including equations
4. Plot of adiabatic flame temperature for each case
5. List all product concentrations for equivalence ratio = 1 and P = 20 atm
6. Plots/tables of NO concentrations for the various cases
7. Compare values in 5. with values found in literature or from commercial code
8. Discussion of results (max. 2 pages)
9. Fully commented printout of the computer program

You may use any programming language or spreadsheet. I will gladly discuss with you the Physics of the problem. But I will not help debugging the code.

PLEASE WORK IN GROUPS OF THREE STUDENTS – OR, AT LEAST, TWO. IF YOU HAVE A PROBLEM FINDING OTHER STUDENT(S) PLEASE LET ME KNOW.