EES – Engineering Equation Solver

Introduction

EES is a software package designed to solve *n* non-linear equations for *n* unknowns. It is particularly useful for ME 300 because of built-in thermodynamic property tables for many fluids (i.e., it looks up properties for you). The program can simplify large problems, such as cycles, and minimize the risk of calculation errors. However, it is most useful for problems requiring iterative solution or for parametric problems, where one property is varied to assess the effect on cycle efficiency, power produced, etc. We will begin to use EES early in the course for very simple problems that could be solved more easily by hand. These exercises will allow you to learn to use EES and to become familiar with its plotting capabilities. It is imperative that you take the time to learn this program as early as possible. If you have not used a numerical equation solver like this before, you will find that the code can be very sensitive to initial guesses, and will sometimes not converge to a solution even though you have entered equations correctly. This is not a limitation of EES, but occurs in all numerical solutions of this type. We will also be using EES to solve more complicated, open-ended problems throughout the semester that cannot be easily solved by hand.

Running EES

EES is installed on most computers in the ME building and can be found in the "Applications" group on the desktop. However, EES is a fairly small program that you may also install on your personal computer. To obtain a copy of EES, copy the files EES.dft and Setup_EES.EXE from the directory in "C:\software\ees\Single file" on any of the ME computers to your computer and run the setup program. This copy will quit working at the end of the semester, but you may continue to install new versions each semester as long as you are at Purdue. The manual for EES is also available in this directory. A Mac version is available in a separate folder.

Using EES

The manual for using EES is available from the course website, is available using the on-line help command in EES, is on reserve in the Potter library, is available for use in ME 100 from Marilyn Morrison, and is available online from www.fchart.com.

EES Format

As with the rigorous format for homework, we require that some structure be used in creating EES programs. In particular, you should (1) have a "Given" section at the beginning of the program for constants, (2) use short but descriptive variable names, e.g., T1, T2, p3, (3) include a system diagram (hand drawn is fine) with each variable and state clearly labeled or a brief problem statement which clearly identifies state locations, (4) use comments to identify which equations you are using, e.g., {first law applied to compressor}, {mass conservation applied to mixer}, (5) include a printout of one solution (with units) and one table or one figure if appropriate, but NOT every plot or table created. Finally, you MUST use units in the calculation by adding them to each variable. Although EES will allow you to do calculations without adding units, this is very dangerous practice and you will not receive full credit for the work. An example of a properly formatted EES problem is included on the course website.