# ME 345 – HTx Fall 2023 Week 11 Homework

## Problem 1 – Convection Flat Plate:

You are to write code in your favorite programming language (EES, MATLAB, MathCAD, Excel, Python, C++, etc.) in order to solve external flow convection problems. Your code should compute the following:

* Necessary properties (at the average temperature between the solid and free-stream temperatures)
* Prandtl number
* Reynolds Number (based on length)
* Average Nusselt Number
* Average convection coefficient
* Calculated transition length (x­­c)

Make sure your code can use relationships for both laminar and turbulent flow. These would be equations 7.30 and 7.38 (or equivalent from the lecture slides).

You may also code in additional relationships for external flow over flat plates.

## Problem 2 – Convection Cylinder in Cross Flow:

You are to write code in your favorite programming language (EES, MATLAB, MathCAD, Excel, Python, C++, etc.) in order to solve external flow convection problems. Your code should compute the following:

* Necessary properties (at the average temperature between the solid and free-stream temperatures)
* Prandtl number
* Reynolds Number (based on diameter)
* Average Nusselt Number
* Average convection coefficient
* Coefficients C, m, and n (as necessary)

You should definitely code in equation 7.52. But you may also code in equations 7.53, and 7.54 (which covers all of the regions without the need for constants C, m, and n.

## Problem 3 – Convection Sphere:

You are to write code in your favorite programming language (EES, MATLAB, MathCAD, Excel, Python, C++, etc.) in order to solve external flow convection problems. Your code should compute the following:

* Same things as above – whatever is necessary to solve the equation

You should code in equation 7.56.