**AEE 342: Aerodynamics, Project 2b – Analysis of Non-symmetric Airfoil Flows**

**Submitted: 02/27/15**

There are many different flow conditions that can be simulated and observed around an airfoil, but certain flows are of particular interest when evaluating its flight performance. Namely, the superposition of uniform rectilinear flow (URF) with vortex flow is largely responsible for the generation of lift and drag, some major indicators of airfoil performance. However, other types of flows are typically modelled over airfoils in order to satisfy some conditions, or to obtain certain data. In this investigation, the goal is to compute the pressure distribution over different airfoils at different angles of attack through a superposition of URF, source flow, and vortex flow. Several different ways to define these flows under conditions consistent with theory are evaluated, as too are the assumptions necessary for such conclusions. The analysis to follow will aim to properly formulate the problems under consideration, to model them on a theoretical basis, and to evaluate the assumptions made in the process.

The first task is to prepare the geometry of the airfoil so that it can best be shown to satisfy physical principles. Namely, this refers to the Kutta Condition which can be represented well on an airfoil with a wedge-shaped trailing edge. The given thickness distribution for a NACA 4 digit airfoil describes an airfoil with a trailing edge that is blunt and does not end precisely at x = 1.