MA 4391 - ANALYTICAL METHODS FOR FLUID DYNAMICS
COURSE OBJECTIVES

Upon completion of this material the student should be able to:

1. Write the basic equations fo °uid dynamics in vector form and in Cartesian component form, describe the physical meaning of each term, and state the assumptions inherent in the equations.
2. De¯ne vorticity, and give a physical explanation of each term in the vorticity equation.
3. State the meaning and utility of the stream function
4. Explain the di®erence between Eulerian and Lagrangian formulations; explain the material derivative.
5. De¯ne and describe the range of application for the following approximations:
   (a) incompressible °ow
   (b) Oseen approximation
   (c) boundary-layer approximation
   (d) potential °ow
6. De¯ne and explain the utility in °uid dynamics of the following mathematical methods:
   (a) dimensional analysis
   (b) matched asymptotic expansions
   (c) similarity transformations
   (d) conformal mapping
7. State the meaning and applicability of the following theorems:
   (a) Reynolds' Transport Theorem
   (b) Bernoulli's Theorem
   (c) Kelvin's Circulation Theorem
   (d) Torricelli's Theorem
   (e) Kelvin's Minimum-Energy Theorem
8. Describe the mathematical formulation and physical interpretation for a variety of simple °ows, including Poiseuille °ow, the Landau jet, Stokes °ow around a sphere, Blasius' °at plate °ow, and the °ow around a Joukowski airfoil.

Ca 9/92