MECE 6372-01
Viscous Flow I
Semester Project
Fall 2011

- Due by the end of the day on Monday December 5th, 2011.
- Counts for 15% of your total grade in the class.
- Work individually.
- Total effort ~ 30 hours.

Project

Perform a literature review, present a written synopsis, and give a ten minute presentation on one of the following topics of fluid mechanics research and/or development. Alternatively, you may choose an equivalent topic not on the list, but you must obtain my approval before proceeding. Topics **must** be related to material covered in this course.

Your written report can be brief and concise, but should (when applicable) contain:

a) an outline of the history of the research and/or development,
b) a summary of the current understanding,
c) a summary of ongoing efforts,
d) a list of references, and
e) a copy of the most relevant articles used.

In Appendices, you **must** include photocopies of several of the most important (or representative) papers and textbook excerpts. Photocopies of paper abstracts may also be included. You can make use of timelines, tables, and figures as necessary. Throughout your report, be sure to appropriately cite your references. Your investigation should go substantially beyond the material presented in our textbook, **Viscous Fluid Flow by F. M. White**.

You must decide on your topic by Thursday September 29th, 2011. Each student must use a different topic. If the topic of your choice has already been selected by another student, then you will be required to select an alternative topic.

Possible Topics

- Determination of the second coefficient of viscosity.
- Stress/Strain rate relations for non-Newtonian fluids.
- Fluid mechanics of slurries.
- Boundary slip flows.
- Laminar entrance region flow for noncircular ducts.
- Laminar flows with significant frictional heating (effects of temperature-dependent viscosity).
- Fluid mechanics of a falling water droplet.
- Oseen's improvement for two-dimensional creeping flows.
- Survey of numerical Navier-Stokes solvers.
- Survey of numerical laminar boundary layer solvers.
- Potential flow/outer boundary layer matching techniques.
- Laminar boundary layer separation prediction.
- Survey of three-dimensional creeping flow solutions.
- Survey of fully developed, steady, laminar flow in noncircular duct solutions.