

ME-712
Mechanics of Viscous Fluids

Course Instructor

Dr. I. Joga Rao
MEC 310, Dept. of Mechanical Engineering
Tel: 973-596-5601 e-mail: raoi@njit.edu

Course Content

This course is designed to provide graduate students with a general introduction to the fundamentals of the mechanics of viscous fluids. The specific topics covered will include a review of vector and tensor analysis, kinematics, balance laws of mechanics, i.e., the conservation of mass, linear momentum, angular momentum and energy applied to viscous fluids. Exact solutions, both steady and unsteady, similarity solutions. Approximate solutions: Stokes approximation, creeping flows. Boundary layer theory. Introduction to Turbulence and stability.

Course Audience

The course is for graduate students in Mechanical, Civil and Biomedical Engineering and students of Applied Mathematics.

Prerequisites

ME 611 (Dynamics of Incompressible Fluids) and ME 616 (Matrix Methods in Mechanical Engineering)

Recommended Text

There is no required text for this course.

Reference (Not exhaustive)

Panton, R. L. *Incompressible Flow*, John Wiley and Sons, (1996).
White, F. M. *Viscous Fluid Flow*, McGraw Hill (2006).
Landau L.D. and Lifshitz E.M. *Fluid Mechanics. Vol. 6. Course of Theoretical Physics*. Pergamon Press, (1984).
Batchelor, G. K., *An introduction to fluid dynamics*. Cambridge. (1967).
Lamb, H. *Hydrodynamics*. Dover. (1932).
Schlichting, H. *Boundary-layer theory*, 7th edition. McGraw-Hill. (1979)

Grading

Two in semester tests worth 25% each, = 50% of grade
Group Homework = 25% of grade
Final project with presentation = 25% of grade