METADATA

Title: Introduction to Fluid Mechanics

Other Titles: -

Language: Greek

ISBN: 978-960-603-178-6

Subject: ENGINEERING AND TECHNOLOGY, NATURAL SCIENCES AND AGRICULTURAL SCIENCES

Keywords: Hydromechanics / Fluid Mechanics

Bibliographic Reference: Flytzanis, N. (2015). Introduction to Fluid Mechanics [Undergraduate textbook]. Kallipos, Open Academic Editions. http://dx.doi.org/10.57713/kallipos-503

Abstract

This course has been taught for many years at a postgraduate level icluding flexibility.. It was subsequently established as an undergraduate course in the hydrodynamics department. Students who attented it continue on to postgraduate studies and many of them are pursuing related specialties. It is aimed mainly at students of physics and mathematics and differs from similar books (for mathematicians and engineers) as it emphasizes physical understanding. Its core is the basic principles of conservation (mass, momentum, energy, etc.) expressed in terms of the field concept. The operators of differential calculus are introduced and related to physical quantities of flow. Indeed, the connection with other fields, e.g. electromagnetism, can be proven to ne very positive and bidirectionall. The first chapters use the tools of vector calculus familiar to fourth-year students, so that the basic laws are developed without mathematical complexity. The concept of tensors is introduced before the chapter on viscous flow, where they are essential, so the student will be already familiar with the philosophy, the description of the field, and the basic laws expressed for microscopic and macroscopic systems. Several examples of creeping viscous flow and a review of energy follows. An important chapter is dimensional analysis, a tool essential in approaches to hydrodynamics. Particular emphasis is given to surface waves, where the restoring force is gravity. Much of the anisodic flow refers to incompressible and turbulent flow, and therefore we have a chapter on the determination of the velocity field from the vorticity field, where the dynamic interaction of vortices is also studied. We have also added a chapter on compressible flow and convection currents, as well as hydrodynamic instabilities. In the latter the emphasis is on a brief introduction to the concept of stability and on understanding the physical role of omitted terms leading to instability.

The Project is funded by the National Development Programme 2021-2025 of the Ministry of Education and Religious Affairs and implemented by the Special Account for Research Funds of the National Technical University of Athens and the Hellenic Academic Libraries Link.