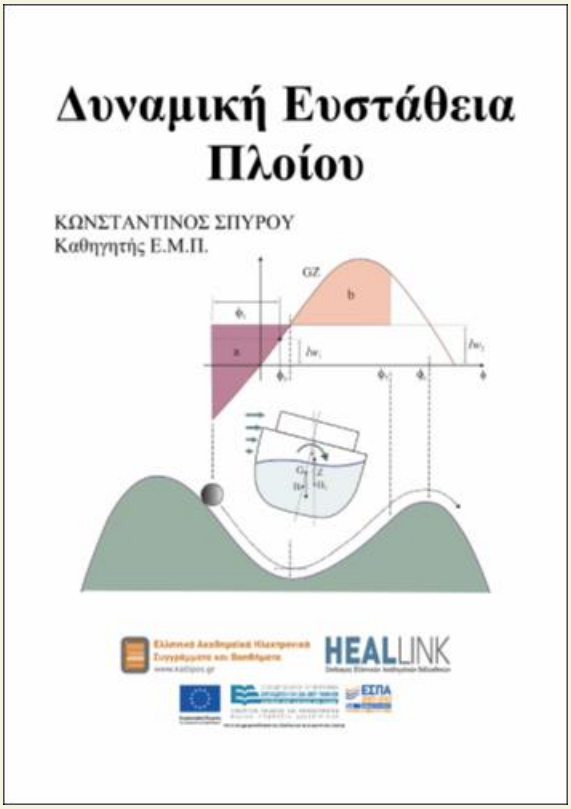

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Abstract

The aim of this book is, on the one hand, to help students understand the basic concepts and methods relating to the broader scientific field of ship stability dynamics and, on the other hand, to provide an in-depth study of the design and operational issues associated with the risk of a ship capsizing. The basic concepts of ship static and dynamic stability are introduced in their historical context. Both the theoretical perspective, starting from a general consideration of the stability of dynamic systems, and the scientific basis and interpretation of regulations are covered. The fundamental mechanisms, based on the dynamics of the system under consideration, that can lead a ship operating in high waves to large angles of heel or even capsize are analyzed. Parametric instability, authentic loss of stability, nonlinear resonance in transverse waves, and the so-called broaching-to instability are analyzed. Design and operational options for avoiding instability are proposed. The so-called "weather criterion," which is the basic stability criterion applied in practice, is critically analyzed. Both the stability of the ship in its intact form and after damage are studied, and the application of probabilistic methods for estimating the achieved safety level is analyzed.

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