

This book provides an introduction to the mathematical aspects of Euler's elastic theory and its application. The approach is rigorous, as well as visually depicted, and can be easily digested. The first few chapters introduce the needed mathematical concepts from geometry and variational calculus. The formal definitions and proofs are always illustrated through complete derivations and concrete examples. In this way, the reader becomes acquainted with Cassinian ovals, Sturmian spirals, co-Lemniscates, the nodary and the undulary, Delaunay surfaces, and their generalizations. The remaining chapters discuss the modeling of membranes, mylar balloons, rotating liquid drops, Hele-Shaw cells, nerve fibers, Cole's experiments, and membrane fusion. The book is geared towards applied mathematicians, physicists and engineers interested in Elastica Theory and its applications.