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	Titolo	Computational reality : solving nonlinear and coupled problems in continuum mechanics / / by Bilen Emek Abali
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	Descrizione fisica	1 online resource (XVII, 308 p. 48 illus. in color.)
	Collana	Advanced Structured Materials, , 1869-8433 ; ; 55
	Disciplina	531.015118
	Soggetti	Mechanics
		Mechanics, Applied
		Computer science - Mathematics
		Numerical analysis
		Materials science
		Solid Mechanics
		Computational Science and Engineering
		Numeric Computing
		Characterization and Evaluation of Materials
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
	Nota di contenuto	Preliminaries -- Mechanics -- Thermodynamics -- Electromagnetic interaction -- Appendix.
	Sommario/riassunto	This book presents the theory of continuum mechanics for mechanical, thermodynamical, and electrodynamical systems. It shows how to obtain governing equations and it applies them by computing the reality. It uses only open-source codes developed under the FEniCS project and includes codes for 20 engineering applications from mechanics, fluid dynamics, applied thermodynamics, and electromagnetism. Moreover, it derives and utilizes the constitutive equations including coupling terms, which allow to compute multiphysics problems by incorporating interactions between primitive variables, namely, motion, temperature, and electromagnetic fields. An engineering system is described by the primitive variables satisfying field equations that are partial differential equations in space and time.

The field equations are mostly coupled and nonlinear, in other words, difficult to solve. In order to solve the coupled, nonlinear system of partial differential equations, the book uses a novel collection of open-source packages developed under the FEniCS project. All primitive variables are solved at once in a fully coupled fashion by using finite difference method in time and finite element method in space.