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Nota di contenuto	A short introduction to Reduced Basis Method -- Part I Worked out problems for beginners: steady cases -- Steady heat conduction in a thermal block -- A linear elasticity problem on a square -- Thermal transfer problem in a parametrized geometry -- A transport problem for the 2D Graetz flow -- Heat conduction with Gaussian flux -- Part II Advanced worked out problems:time dependent and nonlinear cases -- Unsteady heat conduction in a thermal block -- Unsteady heat conduction in a thermal block -- A nonlinear parabolic FitzHugh-Nagumo problem -- Part III Real-life worked out problems: engineering applications -- A thermal conduction problem through an extended surface -- An idealized contact problem in linear elasticity with friction -- A linear elasticity application on a beam bridge -- Part IV Fluid dynamics worked out problems -- Navier-Stokes system for a backward-facing step -- Bifurcating Coanda effect in a channel -- Unsteady Navier-Stokes equations for vortexshedding behind a cylinder -- Part V More advanced worked out problems -- Stabilized reduced method for an advection dominated problem -- A parametrized elliptic

optimal control problem -- Uncertainty quantification for a stochastic thermal block.

Sommario/riassunto

The book is made up by several worked out problems concerning the application of reduced order modeling to different parametric partial differential equations problems with an increasing degree of complexity. This work is based on some experience acquired during lectures and exercises in classes taught at SISSA Mathematics Area in the Doctoral Programme “Mathematical Analysis, Modelling and Applications”, especially in computational mechanics classes, as well as regular courses previously taught at EPF Lausanne and during several summer and winter schools. The book is a companion for master and doctoral degree classes by allowing to go more deeply inside some partial differential equations worked out problems, examples and even exercises, but it is also addressed for researchers who are newcomers in computational mechanics with reduced order modeling. In order to discuss computational results for the worked out problems presented in this booklet, we will rely on the RBniCS Project. The RBniCS Project contains an implementation in FEniCS of the reduced order modeling techniques (such as certified reduced basis method and Proper Orthogonal Decomposition-Galerkin methods) for parametric problems that will be introduced in this booklet.