Pavliotis, Grigorios A.; **Stuart, Andrew M.**

Multiscale methods. Averaging and homogenization. (English) Zbl 1160.35006

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The book is devoted to introduce problems in which different scales may appear. The value of the book is that a wide class of problems is presented and consequently different techniques used to attack these problems are shown.

The book is divided in three different parts. The first is dedicated to present many introductory mathematical instruments, starting from the definition of Hilbert space, giving some basic results about ordinary and partial differential equations, introducing stochastic processes and differential equations, Markov chains and also some arguments more directly connected to the study of homogenization, as two-scale convergence. Nevertheless this introductory part is not sufficient to give a mathematical background about these arguments, but it can be used as a handbook for the arguments treated in the sequel.

Indeed in the other part of the book many problems regarding multiscale or homogenization problems are considered, often presented using a simple, but instructive, example and giving many exercises. This part is divided in a second part, in which the problems and their solutions are presented, and a third one which contains the proofs.

Reviewer: Fabio Paronetto (Padova)

MSC:

35-02	Research exposition (monographs, survey articles) pertaining to partial differential equations
35B27	Homogenization in context of PDEs; PDEs in media with periodic structure
60Hxx	Stochastic analysis
34-02	Research exposition (monographs, survey articles) pertaining to ordinary differential equations

Keywords:

introductory mathematical instruments; ordinary and partial differential equations; two-scale convergence

Full Text: DOI