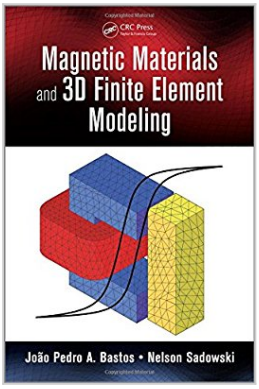

Magnetic Materials and 3D Finite Element Modeling

By João Pedro A. Bastos, Nelson Sadowski

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Magnetic Materials and 3D Finite Element Modeling explores material characterization and finite element modeling (FEM) applications. This book relates to electromagnetic analysis based on Maxwell's equations and application of the finite element (FE) method to low frequency devices. A great source for senior undergraduate and graduate students in electromagnetics, it also supports industry professionals working in magnetics, electromagnetics, ferromagnetic materials science and electrical engineering.

The authors present current concepts on ferromagnetic material characterizations and losses. They provide introductory material; highlight basic electromagnetics, present experimental and numerical modeling related to losses and focus on FEM applied to 3D applications. They also explain various formulations, and discuss numerical codes.

• Furnishes algorithms in computational language

• Summarizes concepts related to the FE method

• Uses classical algebra to present the method, making it easily accessible to engineers

Written in an easy-to-understand tutorial format, the text begins with a short presentation of Maxwell's equations, discusses the generation mechanism of iron losses, and introduces their static and dynamic components. It then demonstrates simplified models for the hysteresis phenomena under alternating magnetic fields. The book also focuses on the Preisach and Jiles–Atherton models, discusses vector hysterisis modeling, introduces the FE technique, and presents nodal and edge elements applied to 3D FE formulation connected to the hysteretic phenomena.

The book discusses the concept of source-field for magnetostatic cases, magnetodynamic fields, eddy currents, and anisotropy. It also explores the need for more sophisticated coding, and presents techniques for solving linear systems generated by the FE cases while considering advantages and drawbacks.

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Review

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?*IEEE Electrical Insulation Magazine*, January/February 2015

About the Author

João Pedro A. Bastos completed his doctoral thesis (Docteur d'Etat) at Université Pierre et Marie Curie, Paris VI, in 1984. He then returned to Brazil at the Universidade Federal de Santa Catarina (UFSC) and became a full professor in 1992. He founded GRUCAD in 1985?a group that plays an important role in the development of the area of electromagnetic field analysis in Brazil. Dr. Bastos worked as a visiting professor at the University of Akron, Ohio, in 1992 and 2001. He is also the author of four books and has published several papers in periodic journals and conferences.

Nelson Sadowski received his engineering and master of science degrees from Universidade Federal de Santa Catarina (UFSC) in 1982 and 1985, respectively. In 1993, he received his PhD from the Institut National Polytechnique de Toulouse (INPT). He then returned to Brazil and continued his research and teaching activities at GRUCAD-UFSC and became a full professor in 1996. In 2000, he received his HDR (Habilitation) diploma, also from the INPT. Dr. Sadowski has been active on international agreements with universities in France, Germany, and Belgium. He is also the author of several conference and journal papers. He is also very active on industrial consulting.

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