

# The Rediscovery of Synchronous Reluctance and Ferrite Permanent Magnet Motors: Tutorial Course Notes (SpringerBriefs in Electrical and Computer Engineering)

*By Gianmario Pellegrino, Thomas M. Jahns, Nicola Bianchi, Wen L. Soong, Francesco Cupertino*

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This book offers an essential compendium on the analysis and design of synchronous motors for variable-speed applications. Focusing on synchronous reluctance and ferrite permanent-magnet (PM) synchronous reluctance machines, it provides a broad perspective on three-phase machines for variable speed applications, a field currently dominated by asynchronous machines and rare-earth PM synchronous machines. It also describes synchronous reluctance machines and PM machines without rare-earth materials, comparing them to state-of-the-art solutions. The book provides readers with extensive information on and finite element models of PM synchronous machines, including all relevant equations and with an emphasis on synchronous-reluctance and PM-assisted synchronous-reluctance machines. It covers ferrite-assisted machines, modeled as a subcase of PM-assistance, fractional slot combinations solutions, and a quantitative, normalized comparison of torque capability with benchmark PM machines. The book discusses a wealth of techniques for identifying machine parameters, with an emphasis on self-commissioning algorithms, and presents methods for automated machine design and optimization, including a software tool developed for this purpose. Addressing an important gap in the field of PM-less and less-PM electrical machines, it is intended as a self-contained reference guide for both graduate students and professional machine designers, and as a useful text for university courses on automated and/or optimized design of electrical machines and drives.

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- Rank: #3043675 in Books
- Published on: 2016-04-28
- Released on: 2016-05-09
- Original language: English
- Number of items: 1
- Dimensions: 9.25" h x .34" w x 6.10" l, .0 pounds
- Binding: Paperback
- 136 pages

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