

## PRINCIPLES OF MAGNETOSTATICS

The subject of magnetostatics—the mathematical theory that describes the forces and fields resulting from the steady flow of electrical currents—has a long history. By capturing the basic concepts, and building toward the computation of magnetic fields, this book is a self-contained discussion of the major subjects in magnetostatics.

Overviews of Maxwell's equations, the Poisson equation, and boundary value problems pave the way for dealing with fields from transverse, axial, and periodic magnetic arrangements and assemblies of permanent magnets. Examples from accelerator and beam physics give up-to-date context to the theory. Furthermore, both complex contour integration and numerical techniques (including finite difference, finite element, and integral equation methods) for calculating magnetic fields are discussed in detail with plentiful examples.

Both theoretical and practical information on carefully selected topics make this a one-stop reference for magnet designers, as well as for physics and electrical engineering students. This title, first published in 2017, has been reissued as an Open Access publication on Cambridge Core.

RICHARD C. FERNOW received his PhD at Syracuse University for work on particle physics and worked at Brookhaven National Laboratory. He contributed to the optimization of the coil design for collider magnets and made calculations of magnetic fields in solenoid channels. He is a member of the American Physical Society.



# PRINCIPLES OF MAGNETOSTATICS

RICHARD C. FERNOW

*Formerly Brookhaven National Laboratory*





CAMBRIDGE  
UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom  
One Liberty Plaza, 20th Floor, New York, NY 10006, USA  
477 Williamstown Road, Port Melbourne, VIC 3207, Australia  
314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre, New Delhi – 110025, India  
103 Penang Road, #05–06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,  
a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of  
education, learning and research at the highest international levels of excellence.

[www.cambridge.org](http://www.cambridge.org)

Information on this title: [www.cambridge.org/9781009291149](http://www.cambridge.org/9781009291149)

DOI: 10.1017/9781009291156

© Richard C. Fernow 2022

This work is in copyright. It is subject to statutory exceptions and to the provisions  
of relevant licensing agreements; with the exception of the Creative Commons version the  
link for which is provided below, no reproduction of any part of this work may take  
place without the written permission of Cambridge University Press.

An online version of this work is published at [doi.org/10.1017/9781009291156](https://doi.org/10.1017/9781009291156) under a  
Creative Commons Open Access license CC-BY-NC-ND 4.0 which permits re-use,  
distribution and reproduction in any medium for non-commercial purposes providing  
appropriate credit to the original work is given. You may not distribute derivative works  
without permission. To view a copy of this license, visit  
<https://creativecommons.org/licenses/by-nc-nd/4.0>

All versions of this work may contain content reproduced under license from third parties.  
Permission to reproduce this third-party content must be obtained from these third-parties directly.

When citing this work, please include a reference to the DOI 10.1017/9781009291156

First published 2017

Reissued as OA 2022

*A catalogue record for this publication is available from the British Library.*

ISBN 978-1-009-29114-9 Hardback

ISBN 978-1-009-29116-3 Paperback

Cambridge University Press & Assessment has no responsibility for the persistence  
or accuracy of URLs for external or third-party internet websites referred to in this publication  
and does not guarantee that any content on such websites is, or will remain,  
accurate or appropriate.