Essential Textbooks in Physics

Vijay Tymms

Newtonian Mechanics for Undergraduates

World Scientific

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Vijay Tymms
Imperial College London, UK

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Published by

World Scientific Publishing (UK) Ltd.
57 Shelton Street, Covent Garden, London WC2H 9HE
Head office: 5 Toh Tuck Link, Singapore 596224
USA office: 27 Warren Street, Suite 401-402, Hackensack, NJ 07601

Library of Congress Cataloging-in-Publication Data
Names: Tymms, Vijay, author.
Title: Newtonian mechanics for undergraduates / Vijay Tymms, Imperial College London, UK.
Description: New Jersey : World Scientific, [2016] | Series: Essential textbooks in physics | Includes bibliographical references.
Identifiers: LCCN 2015030925| ISBN 9781786340078 (UK) (hc : alk. paper) | ISBN 9781786340085 (pbk : alk. paper)
Subjects: LCSH: Mechanics--Textbooks.
Classification: LCC QC127 .T85 2016 | DDC 531--dc23
LC record available at http://lccn.loc.gov/2015030925

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

In-house Editors: Mary Simpson/Dipasri Sardar

Typeset by Stallion Press
Email: enquiries@stallionpress.com

Printed in Singapore by Mainland Press Pte Ltd.

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ISSN: 2059-7630

Published

Vol. 1 Newtonian Mechanics for Undergraduates
by Vijay Tymms

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Overview

1.1. Introduction

I have been teaching physics for 16 years, starting with secondary school teaching, then later university lecturing where I taught the first year mechanics lecture course at Imperial College for four years from 2010–2014. Teaching this course has been one of the most enjoyable parts of my career thus far, giving me an opportunity to reinspect some of the most fundamental concepts in the discipline for delivery to a demanding (though appreciative) audience, complete with multiple demonstrations plus interesting problems and puzzles. During these years I developed and refined a set of comprehensive course notes tailored for the students I was teaching. This textbook is an adaptation of the notes, altered to appeal to a broader audience.

1.2. Why This Book is Needed

School syllabuses are in a state of constant flux. The breadth and depth of core physics and mathematics curricula taught in schools varies a little from year to year and a lot from generation to generation. So while well-established subjects in physics remain the same, the level of knowledge and understanding of students that enter university to study the discipline varies. This means that lecturers have to constantly update their courses to suit their target audiences and make the transition from A-level to degree as smooth as possible.

Although there are already many mechanics textbooks out there, there is a need for producing up-to-date reference material to match the level of development of the target audience. Essentially, textbooks quickly become out of date and there will always be a need for new ones. This particular one is designed to be in line with the level of physics and mathematics that contemporary school leavers ready to start a physics or physics-related degree will have.

1.3. Who Will Benefit From This Book?

The lecture course that led to the creation of this book was designed specifically for first year physics undergraduates at Imperial College and as such the direct target audience of this textbook are students making the transition from school to university.

The book should also appeal to advanced A-level students unsatisfied with the level they have reached, and especially those who are considering studying physics or physics-related subjects beyond school. It contains some A-level material that is delivered at university level of presentation and should strengthen such students' understanding while also providing a smooth introduction to subtopics beyond the syllabus.

A-level physics teachers and first year university lecturers should also find the book useful; as well as the basic subject matter, in-depth examples and problems, there are also suggestions as to basic demonstrations that can easily be recreated in the classroom at minimal expense.

1.4. Assumed Prior Knowledge

Regarding mathematics, all the content that can feature in a standard A-level mathematics syllabus is assumed knowledge throughout