

# Preface and Introduction

## The Combination of Textbook and Study Guide

This textbook is a combination of a printed book and a study guide presented online. The volume of the study guide is nearly twice that of the printed textbook. Both parts are of equal importance.

Mathematics is an essential tool for physicists and engineers which students must use from the very beginning of their studies. This combination of textbook and study guide aims to develop as rapidly as possible the students' ability to understand and to use those parts of mathematics which they will most frequently encounter. Thus functions, vectors, calculus, differential equations and functions of several variables are presented in a very accessible way. Further chapters in the book provide the basic knowledge on various important topics in applied mathematics.

Based on their extensive experience as lecturers, each of the authors has acquired a close awareness of the needs of first- and second-years students. One of their aims has been to help users to tackle successfully the difficulties with mathematics which are commonly met. A special feature which extends the supportive value of the main textbook is the accompanying "study guide". This study guide aims to satisfy two objectives simultaneously: it enables students to make more effective use of the main textbook, and it offers advice and training on the improvement of techniques on the study of textbooks generally.

The study guide divides the whole learning task into small units which the student is very likely to master successfully. Thus he or she is asked to read and study a limited section of the textbook and to return to the study guide afterwards. Learning results are controlled, monitored and deepened by graded questions, exercises, repetitions and finally by problems and applications of the content studied. Since the degree of difficulties is slowly rising the students gain confidence immediately and experience their own progress in mathematical competence thus fostering motivation. In case of learning difficulties he or she is given additional explanations and in case of individual needs supplementary exercises and applications. So the sequence

of the studies is individualised according to the individual performance and needs and can be regarded as a full tutorial course.

The work was originally published in Germany under the title “Mathematik für Physiker” (Mathematics for physicists). It has proved its worth in years of actual use. This new international version has been modified and extended to meet the needs of students in physics and engineering.

In this second international edition printing errors have been corrected and explanations have been improved. Furthermore a new chapter “Fourier Integrals and Fourier Transforms” has been included.

Both the textbook and the study guide have resulted from teamwork. The authors of the original textbook and study guides were Prof. Dr. Weltner, Prof. Dr. P.-B. Heinrich, Prof. Dr. H. Wiesner, P. Engelhard and Prof. Dr. H. Schmidt. The translation and the adaption was undertaken by the undersigned.

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## **How to Access the Study Guide**

The study guide is available for all readers of the books by the internet.

To access the study guide click “[extras.springer.com](https://extras.springer.com)”.

Then you are asked the ISBN number.

It is 978-3-642-54123-0

Now download the entire content or single files.

Then extract the download.

The study guide is presented in two versions. In a first version the study guide is presented on the screen of your PC. You will work online. In this case you follow the instructions given on the screen, at first studying sections of the textbook off the PC. After this autonomous study period you are to answer questions and to solve problems presented online by the PC.

A second version is given as pdf files for students who prefer to work with printed texts. In this case the chosen chapter has to be printed. To use the study guide all necessary explanations are given by the text.



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