

Preface to the Sixth English Edition

This sixth English edition is based on the fifth English edition (2007) and corresponds to the improved seventh (2008), eighth (2012) and ninth (2013) German edition. It contains all the chapters of the mentioned editions, but in a renewed, revised and extended form (see also the preface to the fifth English edition).

Special new parts to be mentioned here are such supplementary sections as Geometric and Coordinate Transformations and Plain Projections in Chapter on Geometry, as Quaternions and Applications in Chapter on Linear Algebra, as Lie Groups and Lie Algebras in Chapter on Algebra and Discrete Mathematics and as Matlab in Chapter on Numerical Analysis. The Chapter on Computer Algebra Systems is restricted to Mathematica only as a representative example for such systems.

Extended and revised paragraphs are given in Chapter on Geometry about Cardan and Euler angles and about Coordinate transformations, in Chapter on Integral Calculus about Applications of Definite Integrals, in Chapter on Optimization about Evaluation Strategies, in Chapter on Tables about Natural Constants and Physical Units (System SI). The Index has been completed to an extent as in the previous German editions.

We would like to cordially thank all readers and professional colleagues who helped us with their valuable statements, remarks and suggestions on the German editions of the book during the revision process. Special thanks go to Mrs. Professor Dr. Gabriella Szép (Budapest), who made this English edition possible by valuable contributions and the basic translation into the English. Furthermore our thanks go to all co-authors for the critical treatment of their chapters.

Dresden, December 2014

Prof. Dr. GERHARD MUSIOL

Prof. Dr. HEINER MÜHLIG

Preface to the Fifth English Edition

This fifth edition is based on the fourth English edition (2003) and corresponds to the improved sixth German edition (2005). It contains all the chapters of the both mentioned editions, but in a renewed revised and extended form.

So in the work at hand, the classical areas of Engineering Mathematics required for current practice are presented, such as “Arithmetic”, “Functions”, “Geometry”, “Linear Algebra”, “Algebra and Discrete Mathematics”, (including “Logic”, “Set Theory”, “Classical Algebraic Structures”, “Finite Fields”, “Elementary Number Theory”, “Cryptology”, “Universal Algebra”, “Boolean Algebra and Switch Algebra”, “Algorithms of Graph Theory”, “Fuzzy Logic”), “Differentiation”, “Integral Calculus”, “Differential Equations”, “Calculus of Variations”, “Linear Integral Equations”, “Functional Analysis”, “Vector Analysis and Vector Fields”, “Function Theory”, “Integral Transformations”, “Probability Theory and Mathematical Statistics”.

Fields of mathematics that have gained importance with regards to the increasing mathematical modeling and penetration of technical and scientific processes also receive special attention. Included amongst these chapters are “Stochastic Processes and Stochastic Chains” as well as “Calculus of Errors”, “Dynamical Systems and Chaos”, “Optimization”, “Numerical Analysis”, “Using the Computer” and “Computer Algebra Systems”.

The Chapter 21 containing a large number of useful tables for practical work has been completed by

adding tables with the physical units of the International System of Units (SI).

Dresden, February 2007

Prof. Dr. GERHARD MUSIOL

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From the Preface to the Fourth English Edition

The “Handbook of Mathematics” by the mathematician, I. N. BRONSHTEIN and the engineer, K. A. SEMENDYAYEV was designed for engineers and students of technical universities. It appeared for the first time in Russian and was widely distributed both as a reference book and as a text book for colleges and universities. It was later translated into German and the many editions have made it a permanent fixture in German-speaking countries, where generations of engineers, natural scientists and others in technical training or already working with applications of mathematics have used it.

On behalf of the publishing house Harri Deutsch, a revision and a substantially enlarged edition was prepared in 1992 by Gerhard Musiol and Heiner Mühlig, with the goal of giving “Bronshtein” the modern practical coverage requested by numerous students, university teachers and practitioners. The original style successfully used by the authors has been maintained. It can be characterized as “short, easily understandable, comfortable to use, but featuring mathematical accuracy (at a level of detail consistent with the needs of engineers)”*. Since 2000, the revised and extended fifth German edition of the revision has been on the market. Acknowledging the success that “BRONSTEIN” has experienced in the German-speaking countries, Springer Verlag Heidelberg/Germany is publishing a fourth English edition, which corresponds to the improved and extended fifth German edition.

The book is enhanced with over a thousand complementary illustrations and many tables. Special functions, series expansions, indefinite, definite and elliptic integrals as well as integral transformations and statistical distributions are supplied in an extensive appendix of tables.

In order to make the reference book more effective, clarity and fast access through a clear structure were the goals, especially through visual clues as well as by a detailed technical index and colored tabs.

An extended bibliography also directs users to further resources.

Special thanks go to Mrs. Professor Dr. Gabriella Szép (Budapest), who made this English debut version possible.

Dresden, June 2003

Prof. Dr. GERHARD MUSIOL

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Co-Authors

Some chapters or sections are the result of cooperation with co-authors.

Chapter resp. section	Co-author
Spherical Trigonometry (3.4.1 – 3.4.3.3)	Dr. H. NICKEL †, Dresden
Spherical Curves (3.4.3.4)	Prof. L. MARSOLEK, Berlin
Geometric Transformations, Coordinate Transformations, Planar Projections (3.5.4, 3.5.5)	Dr. I. STEINERT, Düsseldorf
Quaternions and Applications (4.4)	PD Dr. S. BERNSTEIN, Freiberg (Sachsen)

*See Preface to the First Russian Edition

Logic (5.1), Set Theory (5.2), Classical Algebraic Structures (5.3), Applications of Groups (beyond) 5.3.4, 5.3.5.4 – 5.3.5.6), Rings and Fields (5.3.7), Vector Spaces (5.3.8), Boolean Algebra and Switch Algebra (5.7), Universal Algebra (5.6) Group Representation (5.3.4), Applications of Groups (5.3.5.4 – 5.3.5.6)
 LIE-Groups and LIE-Algebras (5.3.6)
 Elementary Number Theory (5.4), Cryptology , (5.5) Graphs (5.8)
 Fuzzy-Logic (5.9)
 Important Formulas for the Spherical Bessel Functions (9.1.2.6, sub-point 2.5)
 Statistical Interpretation of the Wave Function (9.2.4.4)
 Non-linear partial Differential Equations: Solitons, Periodic Patterns and Chaos (9.2.5) Dissipative Solitons, Light and Dark Solitons (9.2.5.3, in point 2)
 Linear Integral Equations (11)
 Functional analysis (12)
 Elliptic Functions (14.6)
 Dynamical Systems and Chaos (17)
 Optimization (18)
 Using the Computer: (19.8.1, 19.8.2), Interactive System: Mathematica (19.8.4.2), Maple (19.8.4.3), Computeralgebra Systems – Example Mathematica (20)
 Interactive System: Matlab (19.8.4.1)
 Computeralgebra Systems – Example Mathematica (20): Revision of the chapter in accordance with version 10 of Mathematica

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Additional Chapters with Co-Authors in the CD-ROM to the Books of the German Editions 7,8 and 9.

Lie-Groups and Lie-Algebras (5.3.5), (5.3.6)
 Non-linear Partial Differential Equations: Inverse Scattering Theory (methods in analogy to the Fourier method)(9.2.6)
 Mathematical Basis of Quantum Mechanics (21)
 Quantencomputer (22)

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