

Core Maths for the Biosciences

NEW NEW NEW

Martin Reed, University of Bath

- The ideal text for any bioscience student wanting a guide to mathematics for the duration of their degree course.
- Starting with the essentials, the book covers a wide range of mathematical concepts to which a student might be exposed during the course of a bioscience degree, in a self-contained and consistent presentation.
- Emphasises the power of computation in solving mathematical problems, reflecting how mathematical tools are applied in biology today.
- Extensive free online support, including a suite of interactive Excel® spreadsheets, encourages hands-on learning, helping students to master even the most challenging concepts.

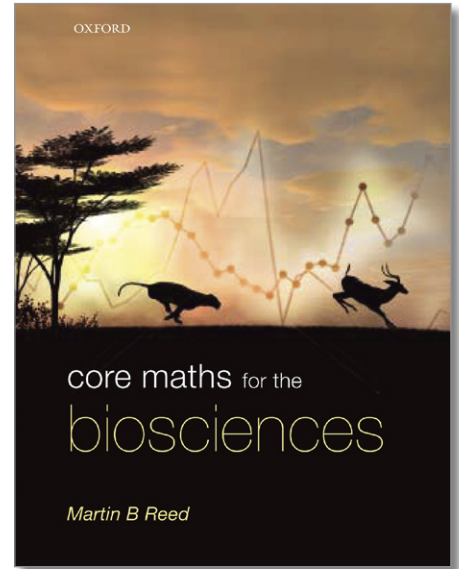
Core Maths for the Biosciences introduces the range of mathematical concepts that bioscience students may encounter - and need to master - during the course of their studies. Starting from fundamental concepts of arithmetic and algebra, the book blends clear explanations and biological examples throughout as it takes the reader towards some of the most sophisticated yet elegant mathematical tools in use by biologists today: differential equations, dynamical systems and chaos theory.

Three case studies appear in instalments throughout the text, illustrating the theory: Models of Population Growth, Models of Cancer, and Predator-Prey Relationships.

Reflecting the use of maths in modern biology, the book shows how computational approaches are applied to probe biological questions, and makes extensive use of computer support to help readers develop intuitive mathematical skills - both through graph-plotting software, and interactive Excel® workbooks for each chapter.

Readership: Undergraduates studying biosciences and bioscience-related subjects at degree and foundation level. Postgraduates will also find useful numerical techniques in the Extension sections at the end of most chapters.

384 pages March 2011 978-0-19-921634-5 Paperback £29.99



“ Fantastic. Easy to understand, interactive, biologically relevant and dictated in a way that seems as though you are almost having a conversation with the author. **Student, University of Oxford** ”

ONLINE RESOURCE CENTRE

For registered adopters of the book:

- Figures from the book in electronic format
- Solutions to all end of chapter exercises

For students:

- Solutions to around half of the end of chapter exercises
- Access to FNGraph, the graph-plotting software featured in the book
- An extensive range of interactive Excel® workbooks, to help the reader master the concepts presented in the book through hands-on learning

www.oxfordtextbooks.co.uk/orc/reed/

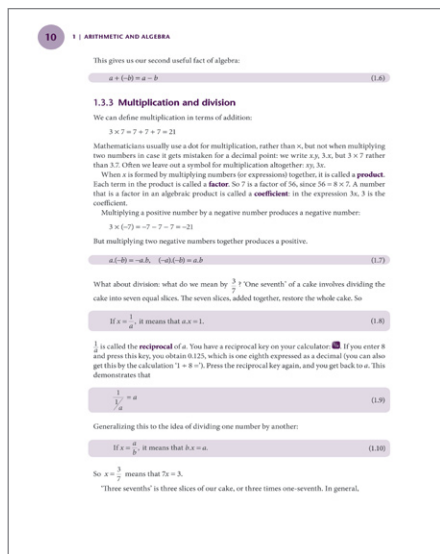
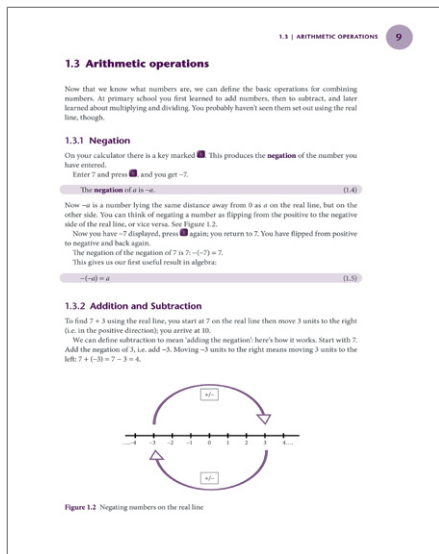
CONTENTS

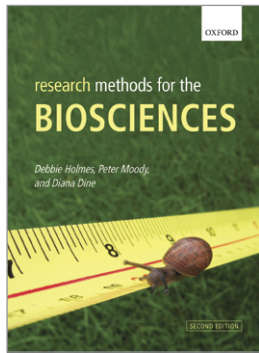
PART 1: ARITHMETIC, ALGEBRA & FUNCTIONS

- 1: Arithmetic and algebra
- 2: Units, precision and accuracy
- 3: Data tables, graphs, interpolation
- 4: Molarity and dilutions
- 5: Variables, functions and equations
- 6: Linear functions and curve sketching
- 7: Quadratic and polynomial functions
- 8: Fitting curves, and reciprocal and inverse functions
- 9: Periodic functions

PART 2: CALCULUS AND DIFFERENTIAL EQUATIONS

- 10: Instantaneous rate of change: the derivative
- 11: Rules of differentiation
- 12: Applications of differentiation
- 13: Techniques of integration
- 14: The Definite Integral
- 15: Differential equations I
- 16: Differential equations II
- 17: Dynamical systems





Research Methods for the Biosciences

NEW EDITION

Second Edition

Debbie Holmes, Peter Moody and Diana Dine, all of the University of Worcester

- Brings together all essential elements of biosciences research into a single, coherent resource.
- Places emphasis on active learning, with questions throughout the text and complementary tasks online, to reinforce essential concepts and skills.
- Fully integrated online resources allow ultimate flexibility of use to support lectures and motivate students to fully explore factors in the book.

New to this edition

- New three part structure organizes the subject in a clearer way, taking the reader from the planning stages, through the analysis of data, and on to the report write-up.

Scientific research is the ultimate tool in pushing forward the limit of our understanding. But, as with any tool, research is only powerful if used properly, and to its full effect. *Research Methods for the Biosciences* demystifies the process of research to equip biosciences students with the skills needed to perform their own investigations. It covers those factors which, collectively, enable effective research, including data collection, analysis, and interpretation, plus legal, ethical, and health and safety considerations.

458 pages 2010 978-0-19-954576-6 Paperback £29.99


ONLINE RESOURCE CENTRE

For registered adopters of the book:

- Questions
- Figures from the book available to download

For students:

- Statistical software walkthroughs for SPSS, Excel, and Minitab
- Complete details of calculations given in the in-text boxes
- Interactive and printable decision tree, to aid experimental design
- Interactive and printable risk assessment form
- Integrative exercises based on published and unpublished student work
- Additional statistical tests



www.oxfordtextbooks.co.uk/orc/holmes2e/

CONTENTS

SECTION 1: PLANNING YOUR EXPERIMENT

- 1: Where do I begin?
- 2: Planning your experiment
- 3: Questions, focus groups, and interviews
- 4: Research, the law, and you

SECTION 2: HANDLING YOUR DATA

- 5: What to do with raw data
- 6: An introduction to hypothesis testing
- 7: Hypothesis testing: do my data fit an expected ratio?
- 8: Hypothesis testing: associations and relationships
- 9: Hypothesis testing: do my samples come from the same population? Parametric data
- 10: Hypothesis testing: do my samples come from the same population? Non-parametric data

SECTION 3: REPORTING YOUR RESULTS

- 11: Reporting your research

Appendix a. How to choose a research project
 Appendix b. Planning your experiment
 Appendix c. Which statistical test should I choose?
 Appendix d. Tables of critical values for statistical tests
 Appendix e. Maths and statistics
 Glossary
 References
 Index

Readership: Intermediate and advanced level undergraduate biosciences students studying a course on research methods, or embarking on a research project. Also an invaluable reference for postgraduates who need a refresher in the essential aspects of planning, conducting, and analysing a research project.



Biomeasurement

A student's guide to biological statistics

Second Edition

Dawn Hawkins, Anglia Ruskin University

Biomeasurement offers a refreshing, student-focused introduction to the use of statistics in the study of the biosciences. With an emphasis on why statistical techniques are essential tools for biostatisticians, the book removes the stigma attached to statistics by giving students the confidence to use and further explore the key techniques for themselves.

CONTENTS

Why am I reading this book?; Getting to grips with the basics; Describing a single sample; Inferring and estimating; Overview of hypothesis testing; Tests on frequencies; Tests of difference: two unrelated samples; Tests of difference: more than two samples; Tests of relationship: regression; Tests of relationship: correlation; Introducing the General Linear Model; Choosing the right test and graph

Readership: Any bioscience undergraduate studying statistics and statistical analysis as part of a bioscience degree. Also a useful primer for beginning graduate students.

368 pages 2009 978-0-19-921999-5 Paperback £24.99

“ The presentation allows readers easily to access material which is relevant to their needs. Chapter 13, on presentation of data, provides an ideal conclusion to book. ”

The Society of General Microbiology


ONLINE RESOURCE CENTRE

For registered adopters of the book:

- Figures from the book in electronic format, ready to download.

For students:

- Data set, for use in a variety of statistical packages, so that students can practise carrying out statistical analysis.
- Literature link articles: full-text versions of the Literature Link articles cited in the text.
- Interactive calculation sheets to help students carry out key statistical tests quickly and easily, without needing other software.



www.oxfordtextbooks.co.uk/orc/hawkins2e/

Experimental Design for the Life Sciences

Third Edition

Graeme Ruxton, University of Glasgow, and Nick Colegrave, The University of Edinburgh

- The only undergraduate text devoted to experimental design for the life sciences, making this essential aspect of biosciences education truly accessible.
- Extensive learning tools throughout the text make it ideal for self-study, as support for lectures, or as a refresher of key concepts during research.

New to this edition

- New section on identifying questions worth answering, and turning such questions into hypotheses and, ultimately, experiments.
- Expanded coverage of between-individual variation, replication, statistical power, and performing observational studies.

Experimental Design for the Life Sciences teaches the reader how to effectively design experiments to ensure today's students are equipped with the skills they need to be the researchers of tomorrow. With a refreshingly approachable and articulate style, the book explains the essential elements of experimental design in clear, practical terms, so the reader can grasp and apply even the most challenging concepts, including power analysis and pseudoreplication.

The inter-relatedness of experimental design, statistics, and ethical considerations is emphasised throughout the book and, above all, *Experimental Design for the Life Sciences* demonstrates how good experimental design relies on clear thinking and biological understanding, not mathematical or statistical complexity - putting it at the heart of any biosciences student's education.

Readership: Undergraduate students in the life sciences taking courses in experimental design, data analysis, quantitative methods, or scientific methodology. The book will also appeal to more experienced scientists who need a succinct reference guide to experimental design.

178 pages 2010 978-0-19-956912-0 Paperback £18.99

ONLINE RESOURCE CENTRE

For registered adopters of the book:

- Figures from the book, available to download

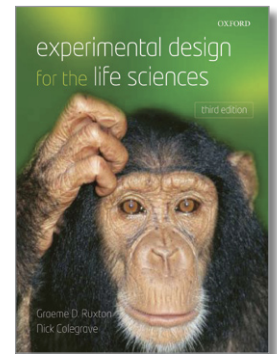
For students:

- Self-test questions and answers
- Extra questions
- Links to useful websites and free software
- Fully worked examples of investigative exercises



www.oxfordtextbooks.co.uk/orc/ruxton3e/

NEW EDITION



I think it is splendid; it is the sort of short and concise text which students remember for a long time and which they hang on to long after the course is passed.
Bernt Walther, University of Bergen

CONTENTS

- Preface - How to use this book
 1: Why you should care about design
 2: Starting with a well-defined hypothesis
 3: Between-individual variation, replication, and sampling
 4: Different experimental designs
 5: Taking measurements
 6: Final thoughts
 Answers to self-test questions
 Flow chart on experimental design
 Bibliography
 Index

Modern Statistics for the Life Sciences

Alan Grafen, University of Oxford, and Rosie Hails, NERC Centre for Ecology and Hydrology, Oxford

This textbook teaches statistics in a different way. It makes the powerful methods of model formulae and the General Linear Model accessible to undergraduates for the first time. The computer revolution has finally made it possible to teach life sciences undergraduates how to use the statistics they really need to know - this book provides the course materials needed to fulfil that possibility. This text presents the fundamental statistical concepts without being tied to any one statistical package.

CONTENTS

Why use this book; An introduction to the analysis of variance; Regression; Models, parameters and GLMs; Using more than one explanatory variable; Designing experiments - keeping it simple; Combining continuous and categorical variables; Interactions - getting more complex; Checking the models A: Independence; Checking the models B: The other three assumptions; Model selection I: Principles of model choice and designed experiments; Model selection II: Data sets with several explanatory variables; Random effects; Categorical data; What lies beyond?; Answers to exercises; Revision section: The basics; Appendix I: The meaning of p-values and confidence intervals; Appendix II: Analytical results about variances of sample means; Appendix III: Probability distributions; Bibliography

Readership: Second and third year undergraduates, MSc students, and post-graduate researchers in the Life Sciences; also a useful resource for students of other non-mathematics-based disciplines using statistics: geographers, psychologists, epidemiologists.

368 pages 2002 978-0-19-925231-2
 Paperback £30.99

ONLINE RESOURCE CENTRE

For registered adopters of the book:

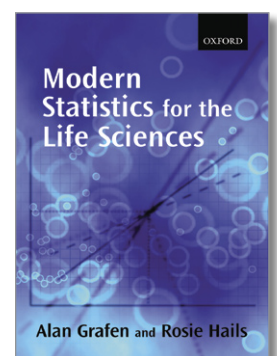
- Figures in electronic format, available to download
- PowerPoint presentations

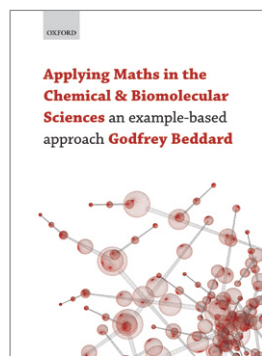
For students:

- Datasets and supplements
- Preface - an introduction by the authors on why to use this book
- Queries to the authors - a page-by-page response by the authors to queries from readers



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Applying Maths in the Chemical and Biomolecular Sciences

An example-based approach

Godfrey Beddard, University of Leeds

The use of mathematics is one of the most powerful tools available to a chemist. *Applying Maths in the Chemical and Biomolecular Sciences* shows why, using an extensive array of examples to demonstrate how mathematics can be applied to probe and understand chemical and biological systems.

The use of maths as a tool in contemporary research has been enhanced through the use of computer software. *Applying Maths* mirrors current practice by embedding the use of software into the text, showing clearly to the student how the use of maths and the use of software now go hand-in-hand.

CONTENTS

Numbers, equations, operators and algorithms; Complex numbers; Differentiation; Integration; Summations, Series and Expansion of Functions; Vectors; Matrices; Matrices in quantum mechanics; Fourier series and transforms; Differential equations; Numerical methods; Monte Carlo methods; Data analysis; Appendix 1: A Maple Language Crib

Readership: Students at both undergraduate and postgraduate level following an intermediate or advanced course in mathematics as applied to chemistry, biochemistry, or biophysical chemistry.

816 pages 2009 978-0-19-923091-4 Paperback £31.99

ONLINE RESOURCE CENTRE

For registered adopters of the book:

- Figures from the text in electronic format, for use in lectures

For students:

- Full solutions to the problems presented in the book

www.oxfordtextbooks.co.uk/orc/beddard/



Very well written and the perfect resource for self study.
The Higher Education Academy Physical Sciences Centre

Statistics and Scientific Method

NEW NEW NEW

An Introduction for Students and Researchers

Peter J. Diggle, Lancaster University; and Amanda G. Chetwynd, Pro-Vice-Chancellor, Lancaster University

An antidote to technique-oriented service courses, this book is different. It studiously avoids the recipe-book style and keeps algebraic details of specific statistical methods to the minimum extent necessary to understand the underlying concepts. Instead, the text aims to give the reader a clear understanding of how core statistical ideas of experimental design, modelling and data analysis are integral to the scientific method.

CONTENTS

Introduction; Overview; Uncertainty; Exploratory data analysis; Experimental design; Simple comparative experiments; Statistical modelling; Survival analysis; Time series analysis; Spatial statistics

Readership: Suitable for postgraduate students in science and health, quantitative researchers and final-year statistics students.

208 pages August 2011 978-0-19-954319-9 Paperback £19.95



Measurements and their Uncertainties

A practical guide to modern error analysis

Ifan Hughes, University of Durham, and Thomas Hase, University of Warwick

This short book is primarily intended to be used in undergraduate laboratories in the physical sciences. No prior knowledge of statistics is assumed, with the necessary concepts introduced where needed, and illustrated graphically. In contrast to traditional treatments a combination of spreadsheet and calculus-based approaches

is used. Error analysis is introduced at a level accessible to school leavers, and carried through to research level. The emphasis throughout is on practical strategies to be adopted in the laboratory. Error calculation and propagation is presented through a series of rules-of-thumb, look-up tables and approaches amenable to computer analysis.

CONTENTS

Errors in the physical sciences; Random errors in measurement; Uncertainties as probabilities; Error propagation; Data visualisation and reduction; Least-squares fitting of complex functions; Computer minimisation and the error matrix; Hypothesis testing - how good are our models; Topics for further summary

Readership: Undergraduate students in the physical sciences - physics, chemistry and engineering. Also graduate students and lecturers in the physical sciences. Students in other scientific disciplines, such as geophysics or mathematical biology.

152 pages July 2010 978-0-19-956633-4 Paperback £19.95