Book Review

A guided tour of mathematical methods for the physical sciences, Roel Snieder, Cambridge University Press, Cambridge, 2001, £55.00, ISBN 0521 782414 (hardback), £16.95, ISBN 0521787513 (paper back)

At first view this is a splendid book, quite a delight to see mathematical models from a different perspective; the author is with the Colorado School of Mines. It has a most unusual approach, being almost entirely problem based. But this same feature, while being excellent for many students, may reduce the potential market. This reviewer teaches modelling techniques to groups of students which includes many whose first comment is ‘but I am no good at maths’. Regardless of the educational or other reasons for this, the modelling of physical processes provides such students with a much needed confidence boost and their parting comments at the end of the course are variants of ‘looked at that way, maths is not really so bad’. While Roel Snieder’s overall philosophy is laudable, his uncompromising approach, which assumes that students can successfully tackle the in-text problems from the start could be a severe drawback, as success with these problems is essential for progression.

So, having started by identifying its main fault, what has this book got to recommend it? It is comprehensive and it is outward looking with many examples drawn from a wide range of disciplines. There is a very constructive intermixing of tools and applications. It starts with chapters on power series, coordinate systems, vectors and vector calculus. Having covered the Laplacian it moves to conservation laws and examples in this area include the explosion of a nuclear bomb, Navier Stokes equation, quantum mechanics and hydrodynamics. Although the subsequent chapters might appear diverse, the author maintains the reader’s interest in a way in which each chapter seems to follow on logically. The chapter on linear algebra uses the Coriolis effect and its consequences amongst the examples. This is followed by chapters on the Dirac delta function, Fourier analysis, analytical functions, complex integration, Green’s functions (principles) and Green’s functions (examples). The treatment is so smooth that it is hard to know at any instant whether one is learning new tools or assimilating the applications to interesting examples. This momentum is maintained right to the end of the 23rd and last chapter.

It is quite astonishing that this relatively slim text contains 429 pages, if we count the excellent set of references and the index. It would have been almost impossible to have included anything else. Nevertheless, there remains the problem that this is really a book for researchers, teachers and the more mathematically confident undergraduate. Several years ago John Wiley published ‘The Maple Computer Manual’ as a companion volume to Kreyszig’s ‘Advanced Engineering Mathematics’. Why not do the same here? Alternatively, the author might consider preparing a set of solutions to the in-text problems and making them available on a web-site. This would immediately convert the book into a valuable self-study text that would be both interesting and accessible to a broad spectrum of students.

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