Book reviews

J.F. Manwell, J.G. McGowan and A.L. Rogers, *Wind Energy Explained: Theory, Design and Application*, Wiley, 2002, 590 pp., £39.95.

Wind energy is currently the fastest growing technology for electricity generation from renewable sources with more than 25 GW of wind turbine capacity installed worldwide and an installation rate in excess of 5 GW/annum. Hence this comprehensive new textbook explaining the fundamentals of wind energy is an important resource for educating the next generation of engineers and technologists who will have to deal with this form of generation. The authors are teachers at the University of Massachusetts, Amherst and are well known and respected internationally for their teaching and research on wind energy. The book reflects their wide experience in teaching courses on wind energy to engineering students since the mid-1970s. The book is based on teaching material used at the University of Massachusetts but the notes have been revised substantially and expanded with the support of the US Department of Energy's National Renewable Energy Laboratory. The topics covered include those one would expect to see addressed in a comprehensive course (or courses) on wind energy. A good understanding of wind energy requires a background in a number of engineering disciplines and introductory material on a number of topics is included within the chapters.

Chapter 1 (18 pages) contains a review of modern wind turbines and a brief history of wind energy. Chapter 2 (60 pages) is a comprehensive discussion of wind characteristics and resources. This is an excellent overview of the subject and will be extremely useful for teaching at either advanced undergraduate or MSc level. Chapter 3 (55 pages) provides the basic theory of the aerodynamics of wind turbines. Again this is comprehensive with a good set of references. Chapter 4 (53 pages) discusses mechanics and dynamics of wind turbines and the important topic of fatigue. Chapter 5 (49 pages) deals with the electrical aspects of wind turbines with a considerable body of introductory material for those students who have not dealt with the basic concepts of electric power and power converters in other courses. Chapter 6 (60 pages) and Chapter 7 (46 pages) deal with wind turbine design and wind turbine control. Both of these chapters contain material for the non-specialist as well as a good set of references for further reading. The remainder of the book looks beyond the individual wind turbine with Chapter 8 (53 pages) addressing wind turbine siting, system design and integration. Chapter 9 (39 pages) deals with wind energy system economics and Chapter 10 (40 pages) discusses the environmental aspects and impacts of wind energy systems. These are important chapters for any course on wind energy as the number of students going on to design wind turbines will be much lower than the number of potential users of the technology. A particular feature of the book is inclusion of problems for each chapter with the solutions and supporting computer codes (referred to as Wind Engineering MiniCodes) on either the Wiley or the University of Massachusetts web sites.

In summary, this is a well-written and comprehensive textbook suitable for advanced undergraduate courses or for MSc teaching. It is pitched at a level to be accessible to later year undergraduates studying engineering or physical science. Obviously such a book is also likely to be of benefit to those employed, or wishing to enter, the wind energy industry. At a cost of £39.95 it is reasonably priced and good value for money. As with all wide-ranging textbooks there is sometimes the danger that individual topics are not covered in sufficient depth but the excellent references do provide a route for the reader to access other literature. The

book deserves a place in the library of every university and college where renewable energy is taught. I already list this book as a recommended textbook for one of my MSc courses and look forward to getting to know the text better over the coming years.

Nick Jenkins *UMIST*

Paul Acarnley, *Stepping Motors: A Guide to Theory and Practice*, 4th edn, IEE Control Engineering Series 63, IEE, 2002, 176 pp, £45/$70.

Stepper motors are of great importance in the modern workplace. Automation on the factory floor continues to increase and PC peripherals like the ubiquitous printer, accompany office workers through their working day. Professor Acarnley has great depth of experience in stepper motors and is particularly well-placed to discuss their operation and control.

A revision of the third edition of this book is timely. The fourth edition not only clearly describes the operation of the motor, the drive circuits required and overall closed-loop and open-loop schemes, but also discusses the means to implement these in hardware, software and the trade-off in using combinations of these two approaches. Difficult subjects are covered well: dips in the pull-out torque characteristic and the relationship between pull-out and static torque are explained in a clear, fluent and precise manner. High-speed operation is given its own chapter with a good discussion of the means to achieve variable voltage excitation. Excellent examples are used throughout. These are detailed enough to aid the reader yet succinct enough not to be overcomplicated.

If one were to wish for improvements, then perhaps one could ask for a more comprehensive literature review and applications section. The section on modern microprocessor control is an excellent addition. However, its brevity means that at times, like many detailed discussions of programme variables, it can become a little difficult to decode.

Overall the book is an excellent addition to the library of an engineer or graduate student seeking to understand stepper motors. It provides a succinct overview of the key concepts, and at a reasonable price too.

Mike Barnes, *UMIST*