Book Review

Waves and oscillations

by R. N. Chaudhuri, New Age International Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi 110002, 2001, pp xi + 424, Rs 200.

This is one of the new generation books that train the students in the task of solving problems and thereby impart a good grasp of the principles and applications of the subject. In the early part of the last century the textbooks had numerous analytical and numerical problems. Typical would be the well-known textbooks of the authors who prepared the candidates for the competitive tests such as the University of Cambridge Tripos and similar open-ended exarninations. Of course, some of the analytical problems are so cleverly contrived to give a simple fmal answer and the numerical problems so arranged to give simple numbers as the answers.By the mid-50s this style of writing textbooks went out of fashion, specially in the USA and USSR, recognizing that real-life situations often do not result in simple formulae or integer
numbers as solutions. The problem-solving sessions became a part of the tutorial classes, the materials for which became Laboratory Notes. In due course, these got crystallized into separate books, for example, from the University of Chicago Press and the Russian publishers. The present book continues this long tradition of combining scholarship with teaching and is one of the volumes of the Basic Physics through Problems Series books by the publishers. The author is a professor of physics at the Visva Bharathi Central University, Santiniketan, and has earlier taught at well-known degree colleges.

The coverage of the topics shows the good background effort in making a comprehensive publication. The book starts with simple harmonic motion in Chapter 1, followed by the superposition principle and coupled oscillations in Chapter 2, the damped harmonic oscillator in Chapter 3 and forced oscillations in Chapter 4. Wave motion is taken up in Chapter 5 and superposition of waves in Chapter 6. Simple ideas of Fourier analysis are covered in Chapter 7. Vibrations of strings and membranes are covered in Chapter 8, while Doppler effect is treated in Chapter 9. The acoustics of buildings is done in Chapter 10. Electromagnetic waves, interference and diffraction phenomena are covered in Chapters 11, 12 and 13. Each chapter has a number of supplementary problems to be solved by the candidates and the answers to these problems are then given, followed by a short index.

Almost all these topics and themes, connected with vibrations and waves, are studied in most Indian universities at the M. Sc. level and occasionally at the B. Sc. (Hons) level. Doppler effect is often treated as a minor adjunct in most places. Architectural acoustics, starting with Sabine's theory, is being sacrificed in most places to give way for other topics considered to be more contemporary and important. The science and engineering curricula are facing pressure at having to leave out some more traditional topics to make room for the recent addiHons. For example, in the present book, one may say that the attenuation of the wave propagation must be mentioned since the damping of oscillations has been treated at length, but then the book will become unduly long if every conceivable linkage is to be included. Taking these practical limitations into account, the coverage of

the present book is balanced and does not leave out any relevant theme.

At the micro-level, the contents of each chapter are also attractive. The general pattern in each chapter is to give a short summary of the principles, work out 10 or 15 exercises in full and then give about 20 or so supplementary problems, to be worked out by the candidates. The final answers to these supplementary problems are given at the end so that the student can calibrate the individual performance.

The vibration and wave phenomena cut across many subdisciplines of physics like mechanics, acoustics, properties of matter, electromagnetism, optics and modern physics. The book touches almost all of these disciplines and would be useful as a supplementary reading material for the main courses in the specific disciplines. For advanced students, who are capable of interconnecting the knowledge of the various subdisciplines, the book will be a good pace setter.

The book is produced well and is pleasant to read, with an introduction of the topics, a number of worked examples and a range of supplementary problems. The student who admires the qualitative beauty of, say, the colours in the interference phenomena of light will be able to work out the quantitative details of the effects. One did not quickly notice any serious error or misleading information. The price is modest and affordable by most of the students. It is warmly recommended for the individuals as well as the libraries.

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Book Review

Differential equations with Maple: An interactive approach

by Jon H. Davis, Birkhauser Verlag AG, Klosterberg 23, CH-4010, Basel, Switzerland, 2001, pp. 432, sfr. 118.

Numerical analysis and computations of various mathematical problems playa very active and important role in the present world of mathematics. It is, therefore, very essential to develop better computational techniques and study the error analysis which is as important as establishing a theorem or a result. The development of newer software packages for treating such problems enhances the importance of numerical analysis. Further, at times, it helps us to understand a particular problem under study in a much wider perspective and in turn helps to prove general theoretical results as well.

The software package Maple is one of the tools which is widely used and is very useful in many computations especially in differential equations. The flexibility to use it as a programming language combined with the capability of symbolic manipulation of mathematical expressions makes it as a largely accepted package. We will not go into these details as we are not reviewing a book on Maple, rather it is a book on differential equations with Maple.

We briefly go into the various chapters of the book. The book is divided into three parts. In the short fIrst part (Chapter 1), the author pinpoints some essential aspects of Maple so that a novice can directly go to the Maple work sheet and begin to play with it.

In the second part {Chapters 2-11), he discusses various theoretical aspects of ordinary differential equations giving necessary hints of programming in Maple as and when necessary .In Chapter 2, he introduces some of the standard physical models from which the fust- and second-order ordinary differential equations are produced. First-order equations with solution techniques are treated in Chapter 3, whereas various numerical methods like Euler, RungeKutta, general RK methods, etc. are discussed in Chapter 4. Higher order equations, Laplace transform methods, systems of equations, stability and periodic solutions are studied in Chapters 5-9.

Impedance is a term associated with electrical circuit analysis. Impedance methods could be adapted in other areas to study the solution methods for constant coefficient differential equations. This is done in Chapter 10. A short Chapter II is devoted to the study of partial differential equations in which the author discusses the three fundamental equations in two variables, namely, Laplace, heat and wave.

All the topics covered in these chapters are at a very elementary level and of course, are available in books on differential equations and numerical analysis. But, on the other hand, a student who has no background in differential equations need not have to go through a rigorous course to understand the material in the book and can use it with minimum mathematical knowledge. So it is a good book to those students who are beginners in both Maple and differential equations.

Such students can use as their first book.

Part III (Chapters 12-17) is devoted to Maple applications, mainly in connection with the mathematical problems studied in Part II. He introduces the plotting techniques for single and vector-valued functions in Chapter 13. Maple and Laplace transforms are carried out in Chapters 14 and 15. The author discusses Maple linear algebra applications like eigenvalues, eigenvectors, matrix exponentials, Jordan forms and so on. All the above examples mainly use the built-in Maple facilities and do not need very serious programming. Much more serious programming is required if one wants to derive truncation accuracy condition for Runge-Kutta schemes. Such Runge-Kutta designs are done in Chapter 16. This chapter together with chapter 17 are the most important chapters as far as programming in Maple is concerned. Development of Maple packages and the installation techniques are explained in detail in the last chapter. This is really useful and further it can be used as stepping stone to be an expert in the usage of Maple.

Overall this is a good book. As mentioned earlier, this book can be used by anyone with very minimal background in both mathematics and programming in general.

Even though the title is 'differential equations with Maple', the author has not touched partial differential equations except for a very small chapter. Indeed, this is a drawback of the book.

The book comes with a CD which justifies the term ' An interactive approach' in the title. The cost is stiff in general and more so to the Indian students. A cheaper Indian edition would benefit them.

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Book Review

Veterinary pathology in the tropics

by Gerald Munene Mugera, New Age International (P) Ltd, 4835/24, Ansari Road, Daryaganj, New Delhi 110002, 2000, pp. 406, Rs 395.

The book deals with the pathology of domestic animals in the tropics and is aimed at veterinary students and practitioners. Nine chapters deal with general pathology and eleven with the pathology of various systems of the body.

The author's efforts to write a textbook to provide basic knowledge to students in pathology is to be welcomed. Such efforts in this area are very limited in developing countries. It is priced moderately for easy access to students.

While the book lays emphasis on biological essentials in pathology, it has many drawbacks that deserve attention.

1. The part of the title 'in the tropics' is irrelevant as the book does not deal with any specific diseases peculiar to tropics only.

2. The references cited are not current, the latest being of 1988. The author has to update the material to make the volume contemporary .

3. The author has to provide at least the outlines of insights into the advancements in the field to motivate the student. These, unfortunately, are lacking. Pathology at cellular level is essential keeping in view the ultramicroscopic morphology and molecular level of dysfunctions.

4. A perusal of the contents shows a large number of spelling mistakes and wrong statements

(a) 'Cirrhosuis' (p. 287); neoplasmas (p. 289); Osteocarthropathy (p. 210); toxeamic (p.200); hydatis cyst (p. 260); wooded 1ongue (p.264); leucopcytic (p. 270); erythropitin (p. 327) oesteoblast; oestoid (p. 205); oesteodystrophy (p. 209); mild acute mastitis (p. 370) and more of this kind.

(b) The following sentence on page 206 is incorrect: 'osteoclasts are the phagocytes of the bone and multinucleated foreign body giant cells can be formed from them. ,

(c) The photographs are in black and white and are put together at the end of each chapter in cluster pattern. The pictures should be interspered with the running text for comprehension and mental registration to retrieve information in actual practice.

The book in the present form is not helpful either to the student or to the practitioner. It needs considerable revision and good colour photographs to improve its value.

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