

Refrigeration and Air Conditioning. Manohar Prasad. New Age International (P) Limited, Publishers, 7/30A, Daryaganj, New Delhi 110 002. 2015. 3rd edn. xix + 565 pp. Price: Rs 325.

The book under review contains 14 chapters divided into three parts. The first two chapters, 'Introduction' and 'Recapitulation of thermodynamics' are quite elaborate and the author has covered sub-topics extensively and aptly. The contents covered therein are worthy of appreciation, but some illustrations like figure 1.3 make no sense. Some other figures, like figure 1.12 need corrections.

The second part is about various aspects of refrigeration. There are no major developments in the area of Carnot, Brayton and aircraft refrigeration systems. Chapter 3 deals with these aspects. Contents covered are articulated well. Many worked-out examples that are provided facilitate the reader to grasp the concepts and contents easily. But some of the figures need corrections. For example, in figure 3.1, processes 2-3 and 4-1 have work interactions along with heat. These are isothermal compressions and not just heat exchangers. In figure 3.2b, both lines are labelled as 300 K. In figure 3.5a, the broken line should start from 2 and not 2', and the cycle also needs to be a closed one. The contents covered in aircraft air-conditioning are advanced and hence a reference pointer is desirable, especially for figure 3.20 which is described inadequately.

The author must be complimented for the nicely written and elaborate chapter on 'Vapour-compression systems'. The level of knowledge base covered is sufficient for a researcher to begin. However, Carnot vapour compression cycle (section 4.1.2) is inappropriate. Simple (or basic) vapour compression cycle is more

or less reproduced and named, probably inadvertently, as Carnot vapour compression cycle. The latter in fact, will have a 'rectangle' cycle within the saturation dome with isentropic compression ending at 3 and isentropic expansion 4-6. Further there are many minor mistakes like, state 3 (represented as 1) in figure 4.2b, states 1, 1' and 2 within the saturation vapour line, etc. Most of the examples are based on R11, R12 and R22, which are either phased out or being phased out, even in India.

Chapters 5 and 6 deal with special topics namely 'Water refrigeration' and 'Vortex and pulse tube refrigeration systems'. These are seldom found in ordinary/normal text books. The author must be complimented for including these research topics in the book. However, there are many mundane errors/mistakes like, 'state of vapour at the exit of condenser', and so on.

Vapour absorption system is presented comprehensively in chapter 7 with principles, theory of mixtures, processes, worked-out examples and so on. It is heartening to see that both ammonia-water and water-lithium bromide systems are dealt with in the book. This advantage is seldom seen in many other textbooks of similar calibre.

Chapter 8 is on thermoelectric refrigeration. Even with low COP, it has niche areas of application. Of late, there is a renewed interest on this topic, vis-à-vis, materials for thermoelectric refrigeration. The chapter, therefore, becomes important. Various aspects of the topic are comprehensively covered. This topic is seldom discussed in general textbooks, thus making this book a special one.

Subjects enumerated under the topic 'Refrigerants' in chapter 9 are seamless and smooth-flowing. However, the aspects of 'ODP and GWP' (ozone depletion and global warming potentials) are missing altogether. The old refrigerants that are being phased out are still retained throughout the chapter, while the replacement refrigerants are completely left out.

The third and final part begins with the chapter on psychrometrics. Various necessary areas are covered and it is quite smooth and seamless. The new ASHRAE chart would be preferred rather than the one having 'enthalpy deviation line'. The derivation of bypass factor (eq. (10.49)) is confusing. Are the number of coils - n and the number of rows of tubes - m the

same? What is n_f in the final equation? In the figure following this (figure 10.12), the unit on the x -axis is in FPS, while the values on the y -axis must be multiplied by 0.1.

In chapter 11, example 11.3 and figure 11.5 seem to have no relevance to the subject matter covered therein. This chapter seems vulnerable without addressing the storage effects building fabrics, cooling load factors for radiation and light loads, sensible and latent heats separately, and so on. The unit used by and large is kJ/h, while kW is preferred.

Chapter 12 'Design of refrigeration equipments' is informative. The title is not apt as ducts, fans/blowers are not refrigeration equipment. Oil separator is given prominence, but the photograph provided therein (figure 12.1b) is that of hermetically sealed condensing unit, which unfortunately does not require an oil separator. The quality of other photographs may be improved. The latest entrant to compressor equipment - 'scroll compressor' may also be included. There is duplicity within figure 12.11d. Figure 12.25 is neither schematic nor actual. Figure 12.27 indicates actual thermostatic expansion valve, but it has a solenoid. On p. 409, it is mentioned that 'In some applications low-float control is used such as in household refrigerator'. Thus this chapter needs a thorough revision for improvement. It is indeed good to observe a separate, short chapter (chapter 13) on 'Balancing of components of refrigeration systems, control and protection devices'.

The final chapter is on applications such as food preservation, cold storage, refrigerators and freezers, water coolers, ice cream and ice, etc. Applications such as liquefaction, effective temperature, thermal analysis of the human body, heat pump, etc. are misfits in the chapter. Cold chain and transport refrigeration, and automotive air conditioning may be included in the chapter.

In conclusion, the book is structured and written well, and also informative. Some chapters deal with advanced topics. The present edition (third) is exactly the same as that of the second edition, except for the preface heading. Each chapter is provided with many references, but most of them are outdated. The latest reference for the entire book is from the year 2001. The references are seldom quoted, making it difficult for the reader to know which one has to be

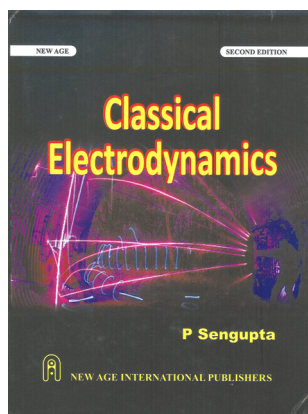
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referred to for a particular issue. The quality of the photograph needs improvement. Some of the schematic figures do not gel well with the descriptive text. In general, figures may be revisited for all possible corrections and to make them more informative and self-explanatory. Thus there is scope for improvement with the inclusion of latest information and references in the book.

M. P. MAIYA

*Refrigeration and Air Conditioning
Laboratory,*

*Department of Mechanical Engineering,
Indian Institute of Technology, Madras,
Chennai 600 036, India
e-mail: mpmaiya@iitm.ac.in*



Classical Electrodynamics. P. Sengupta. New Age International (P) Limited, Publishers, 7/30A, Daryaganj, New Delhi 110 002. 2015. 2nd edn. xii + 224 pp. Price: Rs 695.

A thorough command over electromagnetism is an integral part of a physicist's professional toolkit. A student majoring in physics anywhere in the world typically has to study electromagnetism systematically at least thrice. (1) A high-school level course usually introduces the basic phenomena and the fundamental laws without using calculus or vector analysis. (2) Then, in a college-level course, a student learns how the basic principles of electromagnetism can be handled elegantly through vector analysis. Such a course usually ends with a discussion of Maxwell's equations and derivation of the electromagnetic wave. (3) A final graduate-level course covers the more advanced topics which a professional physicist is expected to know.

The book under review is presumably meant for the third advanced graduate-level course and, curiously, bears the same title as the most widely used textbook at that level by J. D. Jackson. I wonder whether the author deliberately chose the same title as Jackson's book. However, this common title immediately leads one to compare the two books.

The present reviewer has taught electromagnetism at the third, advanced level on several occasions and had extensive discussions with other colleagues who have also taught such a course. I have found that often opinions diverge quite a bit as to what should be the curriculum and approach of such a course. One famous book presenting electrodynamics at the advanced level is Landau and Lifshitz's *Classical Theory of Fields*. If one compares this book with Jackson's *Classical Electrodynamics*, then one finds that the two books are about as different from each other as two books on the same subject can be.

While a strictly logical development of a subject has a great esthetic and intellectual appeal, we often depart from such a development in the interests of pedagogy. A student feels more comfortable with a teacher who begins with more easily accessible materials than those which come first from a logical point of view. Landau and Lifshitz begin with the relativistic action principle and show how the whole of electrodynamics can be developed out of it. Although I consider their book to be a masterpiece of incomparable beauty and grandeur, I myself never had the courage to use it as the primary textbook in a course. In spite of the logical appeal of their approach, I was always afraid that a course based on such an approach may leave many students behind – especially those who are not so much inclined towards theoretical physics. So I have been more conservative in my teaching and have usually followed Jackson's path. However, one colleague braver than me once taught the electrodynamics course in our department following Landau and Lifshitz, and told me that majority of the students could cope with it.

Jackson's book, as well as several other textbooks (including Panofsky and Phillips, which I personally admire much more than Jackson), begin with a lengthy discussion of electrostatics focusing on the solution of boundary value problems. It is often argued by some physicists that

this is purely a topic of mathematical techniques without involving any deep physics and should not be such a major part of a physics course. I personally find no harm in using physics as an excuse for teaching mathematical techniques. After all, physics and mathematics developed hand in hand till about a century ago. Even in this age of computers, many of us believe that a mastery over the analytical techniques of boundary value problem is an indispensable part of a physicist's training. One can debate whether including these techniques in an electromagnetism course is the best way of teaching them. However, if the curriculum of a university does not include these techniques in any other course, then teaching them as a part of the electromagnetism course becomes a natural choice.

After this somewhat lengthy digression on various issues involved in teaching electromagnetism at the advanced level, we now come to Sengupta's book. The main strength of the book is the author's elegant and pleasant writing style. He has the rare ability of developing complex topics in a systematic, easy-to-follow, step-by-step fashion. It is well known that a presentation of advanced electromagnetism requires several lengthy and involved mathematical derivations – especially pertaining to electromagnetic fields of non-uniformly moving charges and the emission of electromagnetic waves from them. Any student would appreciate the extremely clear and student-friendly presentations of these difficult topics in the book. In fact, I would go as far as to say that I am not aware of any other textbook written and published in India which covers these topics with such clarity.

In spite of these obvious merits, the somewhat unconventional coverage of topics limits the possibilities of using this as a primary textbook in a course. Usually teachers and students prefer textbooks which follow the stipulated syllabus of various universities. To the best of my knowledge, the coverage of topics in this book does not correspond to the syllabi of majority of Indian universities, which normally include advanced electromagnetism as a part of the M Sc physics curriculum. This book does not include electrostatics, magnetostatics or basic properties of electromagnetic waves. The treatment of the boundary value problem – which takes up a couple