Spacetime, Geometry and Gravitation. Pankaj Sharan. Hindustan Book Agency (India), P19 Green Park Extension, New Delhi 110 016. 2009. xiv + 355 pp. Price: Rs 550.

There are a large number of text books on gravitation (GR) and yet almost every couple of years a new book comes. I have always been wondering what is then the motivating factor which directs one to make one more addition in the already existing large body? I think there are perhaps two kinds of considerations. One, after working and teaching a subject over a period of time, one develops one's own new perspective which one would like to share and two, one has organized a course in a manner he/she considers, though not very new and original, reasonably effective and efficient. The book under review intends to fall in the second category.

The book is divided into three parts as indicated in the title in that order. The first part has four chapters devoted to introduction, curvature, geodesics and discussion of Schwarzschild solution and planetary orbits. The discussion is supposed to be free of mathematical details like solving the Einstein equation to obtain Schwarzschild solution and is supposed to focus on the physical aspects. Here I am struck by eq. (4.13) for effective potential on page 69 and its plot in figure 4.1 on the following page. It does not include the rest energy of the particle which is an essential part of relativistic equation and that makes energy always >0. The author claims this equation to be an exact result in GR.

The second part has six chapters on geometry in great details. This is a comprehensive part of the book which could have been perhaps a good book in itself.

The third part consists of six chapters spanning through energy momentum tensor for matter and filed, action principle, Penrose diagram, weak field approximation, gravitational waves, Schwarzschild and Kerr solutions and their extensions, cosmology and some special topics. All the solutions are assumed and Einstein equation does not seem to have been solved even to obtain the quintessence Schwarzschild solution.

Cosmological application of GR is by far one of the most exciting things which has a share of bare eight pages in over 350 pages. The book seems to be uneven in its sense of priority in relation to the significance of the physically interesting topics.

The book has a large number of exercises and tutorial sessions, some of which are interesting.

I think the second part on geometry seems to be the strength of the book. However, eq. (4.13) and figure 4.1 need urgent correction.

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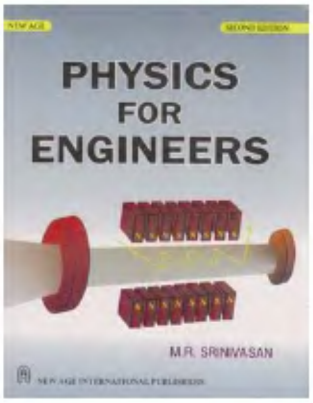

Physics for Engineers. M. R. Srinivasan. New Age International (P) Limited Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi 110 002. 2009. xii + 736 pp. Price: Rs 395.

An illuminating feature of *Physics for Engineers* is the number of applications that it presents in various fields. Many of these applications are exciting and reflect some of the state-of-the-art technologies. Although this book is not intended for rigorous study of physics, the author has made an effort to describe various concepts with mathematical detail that is palatable, and occasionally, somewhat challenging to the intended readers of this textbook.

The first chapter on 'Vibrations and Resonance' considers in detail various cases in free and forced vibrations of a single degree-of-freedom linear oscillator. Basic concepts in resonance such as quality factor and bandwidth are presented. Basic principles behind vibration isolation and vibration absorbers are discussed. The second chapter on acoustics starts with a brief account on reflection, refraction and absorption of sound. Absence of sound shadow due to diffraction is well illustrated. Basic concepts on acoustics of enclosed space such as reverberation are discussed. Sabine's and Eyring's formulae for reverberation time are presented. Different kinds of sound absorbers including Helmholtz resonator for frequency specific absorption are discussed. The later part of the chapter deals with design issues in acoustics for an auditorium. Important concepts covered in the chapter on ultrasonics include wave mode conversion between shear and longitudinal waves, Bragg's diffraction, Raman–Nath diffraction and Doppler's effect. Ultrasonic wave generation by making use of piezoelectric effect, magnetostrictive effect and laser pulsing is presented. Electromagnetic acoustic transducer based on Lorentz force on a conductor carrying current is described in detail. A brief account on mechanical ultrasonic generators such as a siren is noteworthy. Many applications of ultrasonics including ultrasonic imaging are described lucidly.

The chapter on 'Interference and Diffraction' includes most of the traditional material: superposition of waves, Young's double slit experiment, Fresnel's Biprism, interference in thin films, Newton's rings, Michelson's interferometer, Fraunhofer diffraction, diffraction grating and Rayleigh's criterion for resolving power. The reasons for high-resolution of electron microscope and magnetic lens used in electron microscope have been explained well. The chapter on polarization of light is concise and is well presented. It describes obtaining polarized light by reflection (and associated Brewster's law), Nicol prism and Polaroid films. The concept of elliptic polarization is well illustrated. Photoelasticity is a

technique to asses stress distribution of a loaded structure and it makes use of polarized light. The later part of the chapter on polarization deals with this technique. The stress–optic relation which governs this technique is described for both two and three dimensions.

This book has a sizeable chapter on lasers. It starts with properties of lasers such as directionality, monochromaticity and coherence. Laser is obtained as photons emitted when atoms go down from higher energy level to lower energy level through stimulated emission. This has been well-explained using a bit of probability theory. Different types of lasers based on the way they are generated are presented. It includes solid state lasers, semiconductor laser and gas laser. The last part of the chapter deals with various applications of laser. Prominent among them are: Light detection and Ranging (LIDAR), Laser–Doppler velocimetry to measure velocity, material processing such as welding and cutting, laser-eye surgery, compact-disc reader, laser bar code scanner, laser printer and use of laser to separate different isotopes of an element. The chapter on holography starts with the principle of holography and its mathematical theory. The figure used to illustrate the principle requires improvement. It would be helpful if the last part in the mathematical theory concerning reconstruction of image from hologram explains how waves corresponding to three terms in an equation are made to travel in different directions. Probably this will make clear why one wave produces a virtual image of the object whereas the other produces a real image. The latter part of the chapter deals with different types of holograms and their applications.

The chapter on 'Fibre Optics' starts with a brief description of Tyndall's experiment demonstrating guidance of light through a curved water jet. Basic aspects of fibre-optics, total internal reflection and acceptance angle are explained. Problems associated with fibre-optics such as dispersion and attenuation are discussed. Fabrication aspects of optical fibres are described. The latter part of the chapter gives a brief account on communication systems and goes on to describe in detail use of the fibre-optics in communication systems.

The remaining portion of the book is dedicated to modern physics. The chapters here include: duality between particle nature and wave nature, X-rays and basics of quantum mechanics. The chapter on dual nature starts with classical as well as Planck's quantum model for black body radiation. Einstein's photoelectric effect brings about particle nature of light waves. de Broglie's hypothesis on matter waves is illustrated through electron diffraction and other examples. Heisenberg's uncertainty principle, which is a consequence of the dual nature of matter and waves, is illustrated in various situations including giving up of the notion of the orbit of an electron around nucleus to electron orbitals. The chapter on X-rays starts with generation of X-rays, its typical spectrum and associated Moseley's law. Some applications of X-rays including computerized axial tomography (or CT scan) are presented. The latter part of the chapter gives an account on crystal structure and its determination using X-rays. Few other applications are also discussed.

The author has made a good effort to introduce basic quantum mechanics with appropriate level of mathematics (for first-year engineering students). Various results are well-illustrated with graphs. The topics covered include Schrödinger wave equation in both time-dependent and time-independent form, solutions of the wave equation for a particle in simple situations, and significance of the solutions. Tunneling across a potential barrier and its applications are also presented. The presentation of the band theory of solids often tends to be story-like in many textbooks. However, by using the concepts presented in the earlier part of this chapter, the author has described the band theory in a refreshingly different manner.

The last two chapters concern two of the hot research areas: quantum computation and nanotechnology. These chapters could stimulate interest of students towards these areas.

Overall this is a well-compiled book. From the perspective of undergraduate engineering students, I believe, this book has a good balance between analytical and descriptive details.

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Annual Review of Genetics, 2008. Allan Campbell, Elizabeth W. Jones and Gertrud Schupbach (eds). Annual Reviews Inc., 4139 El Camino Way, Palo Alto, CA 94306, USA. Vol. 42. 772 pp.

Annual review series are known for their up-to-date review articles written by the peers in their respective subject area. This volume of the *Annual Review of Genetics* (2008) is no exception. Altogether, there are 30 chapters covering almost all the facets of genetics with organisms ranging from bacteria to human. Most of the chapters provide a summary and future direction and/or problems to be tackled. The first chapter (pp. 1–16) is an introductory personal anecdote by James F. Crow, a renowned population geneticist. He sets the tone of the book by discussing how four theories in population genetics became controversial theories during the mid-20th century. All the four theories: the shifting balance theory, heterosis-dominance vs overdominance, the classical vs the balance hypothesis of population structure, and the neutral theory of molecular evolution became controversial owing to the lack of clear-cut experimental evidences due to techniques involved and the indifferent approach of researchers who concentrated only on observable traits. He also brings out that many of these theories became controversial because of personalities of the main protagonists involved. Though these theories remain more or less unresolved even with advances in molecular tools, he is of the opinion that controversies have their own advantages for the science. However, one should seek cooperativeness to gain deeper insights. In the second article, Herzenberg *et al.* (pp. 19–25) present a bibliographical sketch of the Nobel Laureate Joshua Lederberg's tenure at the Department of Genetics, Standford University. He believed in an interdisciplinary approach and made the department a place where the best brains (specialists) from different fields could interact on a daily basis. He encouraged collaborations between clinical and basic science faculty members, which laid the foundation for what we now call 'translational research'. He foresaw the roles of technology in research, particularly the computer. He was instrumental for the development of many instruments and hardwares/softwares that we still use for our research