



Basic Ideas and Concepts in Nuclear Physics, Second Edition,¹ *K. Heyde*, Institute of Physics Publishing, 1998, pp: 516, ISBN 0750305355 (pbk); Price: US\$57

In teaching nuclear physics at AJKU for some years, I have gone through different graduate and undergraduate textbooks, in particular: *Nuclear Physics* by I. Kaplan, *Nuclear Physics: An Introduction* by W.E. Burcham, *Nuclear Physics* by A. E. S. Green, and *Introductory Nuclear Physics* by K. S. Krane.² All these books have their own importance, but in comparing them with *Basic Ideas and Concepts in Nuclear Physics*, the latter is well updated and will be helpful for all students of nuclear physics. I have recommended this book for my M.Sc. Physics students.

This book develops understanding of nuclear physics in four parts: (1) the constituents and characteristics of the nucleus; (2) nuclear interactions, including the strong, weak, and electromagnetic forces; (3) nuclear structure; and (4) recent developments in nuclear-structure research.

The first part contains two chapters. Chapter 1 discusses the characteristics of the atomic nucleus and the interaction of the nucleus with external fields. Chapter 2 addresses general nuclear-decay properties and transmutations.

Chapter 3, of the second part, discusses various manifestations of transitions that happen in the nuclear A-body system. Chapters 4, 5 and 6 discuss the time dependence of the strong, weak and electromagnetic forces acting within the nucleus.

Part three's Chapter 7 discusses collective properties related to the liquid-drop-model approach used to describe a number of smoothly varying properties such as nuclear binding energy. Chapter 8 gives a simple explanation of an independent-nucleon model describing the nucleus as a non-interacting Fermi gas. Chapter 9 discusses the experimental facts that lead to the nuclear-shell model. It also presents a solvable model that uses the harmonic-oscillator potential as an approximation to the average single-particle field. Chapter 10 discusses single-particle excitations and global nuclear properties.

In the fourth part, Chapters 10 to 13 discuss how nucleons may be raised to higher excitation energies by means of external stimuli such as heating, or rapidly "cranking" the nucleus.³ Chapter 14 gives: a detailed discussion on neutron drip-line⁴ physics; radioactive ion beams (RIBs); isotope separation on-line (ISOL); and in-flight separation (IFS) techniques. Also included is discussion on applications to nuclear astrophysics. The chapter has two interesting boxed sections: one on the discovery of the heaviest $N = Z$ doubly-closed shell nucleus ^{100}Sn , the second on the present status of radioactive ion-beam facilities. Finally, Chapter 15 discusses studies and observations of mesons inside the nucleus.

The author gives mathematical details as and when they are necessary and problems at the end of each part of the book. Since he includes recent experimental and theoretical research results, the book is that much up to date.

The material is more than can normally be covered in a one-semester course meeting three hours per week.

In my professional opinion, this is an excellent text for study levels ranging from senior-undergraduate to beginning-researcher. From a pedagogical point of view, however; this book could be improved if more solved examples were added at the end of each topic, and more problems given at the end of each part of the book. These should include thought-problems.

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1. The third edition, ISBN 0-750-30980-6, was issued in 2004. -Ed.(BR)
 2. Respectively: Addison-Wesley (1962) ISBN 0201036029; Longman (1973) ISBN 0582441102; McGraw-Hill (1955); Wiley (1987) ISBN 047180553X. -Ed.(BR)
 3. “Cranking” the nucleus means increasing its claimed angular velocity. See, e.g.: <http://www.nature.com/nature/journal/v310/n5977/abs/310457a0.html> -Ed.(BR)
 4. According to <http://encyclopedia.thefreedictionary.com>, an unstable atomic nucleus beyond the “neutron drip line” will eject, or “leak” free neutrons. -Ed.(BR)