

Preface

This fundamental classic text on Modern Physics needs no introduction! Arthur Beiser's textbook, *Concepts of Modern Physics*, has been the standard undergraduate textbook for a course in Modern Physics ever since it was issued in 1963. Incorporation of several new topics, particularly in quantum mechanics and elementary particles, in the Sixth Edition (2003) increased its popularity even further.

Rationale of the Adapted Edition

A need was felt to update the book in sync with the latest syllabi of many Indian Universities and with all important developments in Physics since 2003. Further, feedback and suggestions received from students and instructors motivated us to bring out this new edition.

New to the Edition

Among the topics added to this edition, in response to suggestions from instructors for alignment with various syllabi, are the Sommerfeld atom, Vector atom model, Many electron atoms, Ritz Combination Principle, Cosmic rays and Raman effect. These inclusions now make the book more useful for students of various universities where these topics form a part of the syllabus.

The adapted edition has been revised extensively and restructured to emphasise recent advancements in Physics. These include a discussion of precision tests of relativity, classical and quantum interference, the measurement problem in quantum mechanics, quantum Hall effect and relativistic quantum mechanics. Two new chapters have been included—Chapter 14 on Cosmology which gives an introduction to the recent progress of the subject, and Chapter 15 on Radioisotopes and Radio-physics discusses several topics including nuclear fusion. The new edition also incorporates several useful experiments which can be performed in the laboratory to demonstrate the concepts.

The Users

This edition, like the editions that preceded it, is intended for undergraduate students of Science and Engineering who can use this as a first course in Modern Physics. In addition, it will prove to be a valuable reference for those appearing for various competitive examinations.

What Makes this Book Outstanding?

This book provides concise and balanced account of all key concepts, as well as recent developments and applications in the field. To help build conceptual framework, abundant solved and unsolved problems, varying from simple to complex, have been incorporated.

- Coverage to all important topics such as Relativity, Quantum Mechanics, Nuclear Physics, Elementary Particles, Radioactivity and Zeeman Effect.
- Two New Chapters on 'Astrophysics & Cosmology' and 'Radioisotopes & Radio-Physics'.
- Rich Pedagogy.
- More than 400 Figures and Tables.
- More than 700 Solved Problems and Unsolved Problems.
- 13 Chapter Comprehension Questions, solved using step-by-step approach.

- New Practical Laboratory Experiments, like Hall Effect, Michelson Interferometer, Millikan Oil Drop, Zeeman Effect and Two-slit Interference.
- Frontiers and Applications on recent topics like ITER Project and Lasers.

Supplements

Students and instructors are recommended to refer the <http://www.mhhe.com/beiser/cmp6sie> online information to access resources including Articles, Sample Chapters, Scientist and Contributors and Practical Experiments.

Chapter Organisation

The book has been reorganised to enrich the content and enhance the pedagogy. **Chapter 1** discusses precision tests of the postulate of constancy of the speed of light as well as the mass-energy relationship in relativity. In addition, we have given a qualitative discussion of the general theory of relativity and the classical tests which were carried out to confirm the theory. **Chapter 2** provides a detailed exposition of the well-known, two-slit interference experiment but at ultra low intensities of light which is now possible. This allows us to distinguish between quantum and classical interference pattern. It also explains the quantum properties of waves other than electromagnetic waves.

Chapter 3 presents the important issue of disturbance caused by observations of quantum interference experiments. It discusses an experiment performed, where it is possible to determine which slit the atom/electron passes through and its impact on the interference pattern on the screen. The Ritz Combination Principle has been incorporated in this chapter. **Chapter 4** deals with the Sommerfeld atom and removal of degeneracy and relativistic corrections.

Chapter 5 elucidates one of the central problems in quantum mechanics—the measurement problem. The collapse hypothesis and possible alternatives to quantum mechanics are also discussed in this chapter. Further, we provide a short elementary introduction to Relativistic quantum mechanics. The new inclusion in **Chapter 6** is the nature of degeneracy in the hydrogen atom as well as a discussion of the relativistic hydrogen atom. We also have a brief section on accidental degeneracy.

Based on the feedback obtained for the previous editions, a discussion of quantum chemistry and many electron atoms have been incorporated in **Chapter 7**. In addition, we have also discussed the vector atom model, the various coupling schemes and the Stark and Paschen-Back effects which arise when an atom is placed in electrical and magnetic fields. The new inclusion in **Chapter 8** is the Raman effect and in **Chapter 9**, the relationship between statistical mechanics and thermodynamics, and an introduction to fluctuations have been incorporated.

Chapter 10 covers the quantum Hall effect and its importance, while **Chapter 11** provides information on nuclear matter and nuclear potentials. **Chapter 12** offers information on beta decay, artificial radioactivity and short lived isotopes. The nature, origin and properties of cosmic rays are the new enhancements to **Chapter 13**.

Chapter 14 is a new chapter that focuses on Cosmology and reviews our current understanding of the universe and its history. In addition, it also discusses dark matter and dark energy which are being used in explaining certain anomalies in the standard model of cosmology. Evolution of stars from gas clouds to their ultimate fate in terms of black holes, white dwarfs and neutron stars also form a part of the new chapter. A discussion on Van Allen radiation belts, and an entire section on elementary particles and their interactions are presented in this chapter.

The new **Chapter 15** elucidates the physics of nuclear fission as well as the kinds of reactors which are used to harness the energy from it. The topics of Nuclear fusion and the ITER project are covered. The chapter presents a useful discussion of particle accelerators and particle detectors and a short introduction to the Large Hadron Collider—the world's largest particle accelerator.

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A K Jain

*Dept. of Physics, IIT Roorkee ,
Uttarakhand*

S Dev Sharma

*Dept. of Physics,
Himachal Pradesh University,
Himachal Pradesh*

Shashi K Dhiman

*Dept. of Physics,
Himachal Pradesh University,
Himachal Pradesh*

S S Malik

*Dept. of Physics, GND University,
Assam*

Jayanta Kumar Sarma,

*Dept. of Physics, Tezpur University,
Assam*

Dipan K Ghosh

*Dept. of Physics, IIT Bombay,
Maharashtra*

Sanjay Kumar Singhal

*Dept of Engineering, Ibra college of Technology,
Directorate of Technical Education,
Ministry of Manpower,
Oman*

Our concentrated effort has been to make this classic text more up-to-date with a discussion of the latest developments in the subject. These discussions are, adhering to the style of the book, qualitative and intended to provide the essence of the subject, rather than being a detailed mathematical discussion.

Do you have a feature request? A suggestion? We are always open to new ideas (the best ideas come from you!) and constructive criticism. You may send your comments to tmh.sciencemathsfeedback@gmail.com (*kindly mention the title and author name in the subject line*).

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**Arthur Beiser
Shobhit Mahajan
S Rai Choudhury**