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Semiconductors and Modern Electronics

Semiconductors and Modern Electronics

Chuck Winrich

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Contents

Preface	vii
Acknowledgments	viii
Author biography	ix
1 Introduction	1-1
References	1-3
2 Conductors, insulators, and electric circuits	2-1
2.1 Conductors versus insulators	2-1
2.2 Electric circuits: voltage and current	2-2
2.3 Electrical resistance, current, and Ohm's law	2-4
2.4 Summary	2-5
References	2-5
3 Early developments in semiconductors	3-1
3.1 Changes with temperature and light	3-1
3.2 Rectifiers	3-2
3.3 Developments towards a theory	3-2
References	3-3
4 Band theory and impurities in semiconductors	4-1
4.1 The band theory of solids	4-1
4.2 Impurities	4-9
4.3 Donor impurities	4-10
4.4 Acceptor impurities	4-12
4.5 Summary	4-13
References	4-14
5 Diodes and solar cells	5-1
5.1 Diodes	5-1
5.2 Light-emitting diodes (LEDs)	5-6
5.3 Solar cells	5-7
5.4 Summary	5-8
References	5-8

6	Transistors and logic circuits	6-1
6.1	Junction transistors	6-1
6.2	Field-effect transistors	6-4
6.3	Logic gates	6-5
6.4	Logic circuits	6-8
6.5	Summary	6-11
	References	6-11
7	Development of semiconductors to modern devices	7-1
	References	7-5

Preface

This book came out of an electronics course for students at Babson College. Babson is a small business college, so none of the students are majoring in science. In my classes, I try to emphasize the applicability of the science we study to everyday experience. In electronics, that means connecting the concepts we discuss to the electronic devices that people have and use. My electronics course is also an introductory course with no prerequisites or assumptions of prior knowledge. There are many fine books on semiconductors and semiconductor devices, but I found that most of them were either written for advanced students in physics or electrical engineering, or presented material as facts to be accepted without explanation. As a result, I developed materials for my course to present the concepts behind semiconductors in a way that would help explain the science behind semiconductors to understand their applications.

As a book that was developed from teaching materials, it is natural to suggest that others could use this book in courses. However, I think it can also serve as an introduction to anyone interested in the science behind the many types of semiconductor devices we find commonplace today, including LED lights, solar cells, and computers to name just a few. I suggest this as an introduction because I think that this book is an example of the Pareto principle – the majority of your results come from a small part of your efforts. This book focuses on a few big ideas that we can use to understand and explain semiconductor devices. From that big-idea introduction (the small part of effort) we can understand the basis for many applications where semiconductors are useful (the large part of results) even if we do not examine every variation of every type of device.

Like any author, I hope you enjoy this book. If this is the end of your study of semiconductors, I hope you find a new appreciation of semiconductors and all of the ways that they can be useful in devices. If this serves to whet your appetite to study further, I hope this introduction will continue to be useful as you learn more about the differences and variations among different semiconductor materials and the different devices that are made from them.

Chuck Winrich
Wellesley, Massachusetts
July, 2019

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Author biography

Chuck Winrich



Chuck Winrich teaches Physics and Astronomy at Babson College. He earned a BS in Physics from the University of Wisconsin-Eau Claire, an MS in Astrophysics from Iowa State University, and an EdD in Curriculum and Teaching, focused on Physics Education, from Boston University. His work is focused on courses, curricula, and pedagogy for teaching students who are not majoring in science. He is particularly interested in the use of the history and philosophy of science for understanding scientific concepts, and the application of science to understanding technology and practical problems. This latter effort involves working with students on prototype devices, and alternative spring break trips. In addition to classroom teaching, Chuck has worked on teaching science in less formal settings. He managed the planetarium at the Schenectady Museum where he engaged schools and community groups in exploring scientific principles.

Chuck has also been active in the physics education community. He has presented his work at National Science Teaching Association meetings and at the American Association of Physics Teachers (AAPT) meetings. He was appointed to AAPT's Committee on Science Education for the Public and served one term. He is currently a member of AAPT's Committee on History and Philosophy of Physics.