## CONTENTS

	Page
CHAPTER 1 SOLAR ENERGY AND ENERGY NEEDS	1
1.1 Sunlight	2
1.2 United States Energy Requirements	5
1.3 U.S. National Photovoltaic Program	8
1.4 Economic and Social Implications	11
1.5 Less-Developed Countries	13
1.6 Summary	15
References	16
CHAPTER 2 BASIC PRINCIPLES	19
2.1 Crystalline Solids	19
2.2 Band Theory	22
2.3 pn Junctions	28
2.4 Metal-Semiconductor Junctions	36
2.5 Heterojunctions	39
2.6 Idealized pn Junction Solar Cell	42
2.7 Practical Analysis	47
2.8 Summary	50
References	51
CHAPTER 3 ESTABLISHED TECHNOLOGIES	53
3.1 Single or Semicrystal Si Cells	72
3.2 Single-crystal GaAs Cells	85
3.3 CdS/Cu <sub>2</sub> S Cells	90
3.4 Summary	92
CHAPTER 4 RESEARCH DIRECTIONS	95
4.1 Nonconventional Silicon	96
4.2 Amorphous Si-H Alloy Cells	107
4.3 Polycrystalline Thin III-V Thin Film Cell	116
4.4 Other Materials and Concepts	135
4.5 Summary	145
References	146
CHAPTER 5 BEYOND THE CELL	149
5.1 Flat-Plate Modules	150
5.2 Concentrator Modules	160
5.3 Storage and Power Conditioning	173
5.4 Endurance Testing, Standards and Certification	177
5.5 Cost Impact of BOS Elements	181
Reference	183
CHAPTER 6 ECONOMIC AND SOCIAL CONSIDERATIONS	185
6.1 Standard Economic Analyses	186
6.2 Hybrid and Nonresidential Systems	193
6.3 Social and Environmental Impact	197
6.4 Solar Energy and Inflation	201
References	203
BIBLIOGRAPHY	205
INDEX	207