

Contents

<i>Preface</i>	<i>page xi</i>
<i>Preface to the First Edition</i>	<i>xiii</i>
<i>Acknowledgments</i>	<i>xvii</i>
1 Framing the Issues	1
1.1 Representation of Artifacts for Design	1
1.2 Representation of the Design Process	3
1.3 An Illustration from Structural Engineering	6
1.4 On the Role of Computation	8
1.5 Bibliographic Notes	10
2 Engineering Design	12
2.1 From Design to Engineering Design	12
2.2 A Definition of Engineering Design	16
2.3 Bibliographic Notes	19
3 Characterizing the Design Process	20
3.1 Dissecting the Design Process	20
3.2 Describing the Design Process	22
3.3 Prescriptions for the Design Process	25
3.4 Information Processing Models of Design	30
3.5 Design Methods in the Design Process	34
3.6 Bibliographic Notes	37
4 Taxonomies of Engineering Design	39
4.1 Routine versus Creative Design	39
4.2 A Taxonomy of Mechanical-Design Problems	43
4.3 A More General Mechanical-Design Taxonomy	47
4.4 A Task-Level Taxonomy for Selection Design	53
4.5 Selection Design Refined	54

4.6	Knowledge-Level Analysis of Design	55
4.7	Analysis of Design Tasks	59
4.8	Toward a Unified Taxonomy?	61
4.9	Bibliographic Notes	67
5	Representing Designed Artifacts	69
5.1	The Languages of Engineering Design	69
5.2	Images of Designed Artifacts	73
5.3	Feature-Based Descriptions	79
5.4	Object-Oriented Descriptions	85
5.5	Integrated Descriptions	92
5.6	Communicating about Designed Artifacts	100
5.7	Bibliographic Notes	110
6	Representing Design Processes	113
6.1	Classical Design Methods	113
6.2	AI-Based Problem-Solving Methods	122
6.3	Models of Design Processes	137
6.4	Bibliographic Notes	153
7	Where Do We Go from Here?	155
7.1	Uses of Symbolic Representation in Engineering Design	155
7.2	Research on Representation in Design	163
7.3	Symbolic Representation in Engineering-Design Education	167
7.4	Bibliographic Notes	171
	<i>References Listed in First Edition</i>	173
	<i>New References</i>	182
	<i>Index</i>	189