

# CONTENTS

## Part I LOGICAL AND FUNCTIONAL AIDS TO DESIGN

### Chapter 1 Decision Theory 3

W. B. Cottingham and P. W. McFadden (source authors)

1-1 *Decision making in the design process, 4*

1-2 *Utility theory, 8*

1-3 *Decision making under constraints, 19*

1-4 *Decision trees, 30*

### Chapter 2 Optimization Theory 37

W. B. Cottingham (source author)

2-1 *The general model for optimization problems, 38*

2-2 *Simple differential calculus, 39*

2-3 *Lagrangian multipliers, 44*

2-4 *Calculus of variations, 49*

2-5 *Mathematical programming, 57*

2-6 *Linear programming, 61*

2-7 *Search methods, 75*

<b>Chapter 3</b>	<b>Variations and Tolerances in Design</b>	<b>87</b>
	W. B. Cottingham (source author)	
	3-1 <i>Statistical tools for inference</i> , 88	
	3-2 <i>Unavoidable error</i> , 97	
	3-3 <i>Designing with consideration for error</i> , 103	
	3-4 <i>Design of experiments</i> , 107	
<b>Chapter 4</b>	<b>Project Scheduling</b>	<b>122</b>
	P. W. McFadden (source author)	
	4-1 <i>Program evaluation and review technique</i> , 122	
	4-2 <i>Critical path method</i> , 130	

## Part II COMPUTER AIDS TO DESIGN

<b>Chapter 5</b>	<b>Digital Computer Fundamentals</b>	<b>139</b>
	P. M. Sherman	
	5-1 <i>Computers in engineering design</i> , 140	
	5-2 <i>Computer organization and operation</i> , 143	
	5-3 <i>Problem analysis</i> , 154	
	5-4 <i>Computer programming</i> , 168	
	5-5 <i>Program development</i> , 202	
	5-6 <i>Programming examples</i> , 208	
	5-7 <i>Summary</i> , 221	
<b>Chapter 6</b>	<b>Computer Applications in the Design Process</b>	<b>225</b>
	P. M. Sherman and R. A. Tutelman	
	6-1 <i>Computer applicability to design problems</i> , 226	
	6-2 <i>Elements of computer-aided design</i> , 233	
	6-3 <i>Information storage and retrieval</i> , 263	
	6-4 <i>Machine-aids systems</i> , 274	

## Part III SYSTEM RELIABILITY

<b>Chapter 7</b>	<b>Reliability—Basic Concepts and Allocation</b>	<b>283</b>
	R. C. Winans	
	7-1 <i>Basic reliability definitions</i> , 284	
	7-2 <i>System reliability characteristics</i> , 288	
	7-3 <i>A system reliability program</i> , 296	
	7-4 <i>Initial allocation processes</i> , 296	
	7-5 <i>Allocation to lower equipment levels</i> , 313	

<b>Chapter 8 Reliability of Electronic Parts</b>	<b>332</b>
R. C. Winans	
8-1 <i>Effects of stresses on reliability</i> , 333	
8-2 <i>Failure modes and mechanisms</i> , 334	
8-3 <i>Failure rates versus stress levels</i> , 337	
8-4 <i>Electronic parts application considerations</i> , 349	
8-5 <i>Probability distribution functions</i> , 357	
8-6 <i>Reliability control and prediction for electronic parts</i> , 366	
<b>Chapter 9 Reliability Prediction and Design Review</b>	<b>372</b>
R. C. Winans	
9-1 <i>Prediction methods for design review</i> , 372	
9-2 <i>System evaluation testing</i> , 380	
9-3 <i>Maintenance considerations</i> , 386	
9-4 <i>Summary and future trends</i> , 390	
<b>Part IV APPROACH TO PHYSICAL DESIGN</b>	
<b>Chapter 10 System Organization and Partitioning</b>	<b>395</b>
10-1 <i>Establishing system requirements</i> , 396	
10-2 <i>Nature of the partitioning problem</i> , 412	
10-3 <i>Partitioning and performance</i> , 419	
10-4 <i>Partitioning and reliability</i> , 421	
10-5 <i>Partitioning and cost</i> , 426	
<b>Chapter 11 Module and Interconnection Design</b>	<b>440</b>
J. M. Rausch	
11-1 <i>Integrated circuit packaging</i> , 441	
11-2 <i>Printed wire board techniques</i> , 448	
11-3 <i>Interconnection techniques</i> , 472	
11-4 <i>Equipment structures</i> , 495	

<b>Chapter 12</b>	<b>Case Study: The Advanced Data Processing System</b>	<b>505</b>
	12-1 <i>System organization and design requirements</i> , 507	
	12-2 <i>System partitioning and structural design</i> , 512	
	12-3 <i>Heat-transfer design</i> , 537	
	12-4 <i>Electrical constraints and interconnection design</i> , 549	
	12-5 <i>Computer aids to design</i> , 569	
	12-6 <i>Outlook for the future</i> , 580	
<b>Appendix A</b>	<b>Principal Symbols and Units</b>	<b>583</b>
	<b>Index</b>	<b>587</b>