CONTENTS

Chapter 1	The Nature of Physical Design	1
_	Part I STATICS AND DYNAMICS OF STRUCTURES Statics of Structures F. T. Flaherty, Jr.	21
	2-1 Stress, 22 2-2 Equations of motion, 29 2-3 Strain, 31 2-4 Material properties, 37 2-5 Statics and quasistatics, 48	
Chapter 3	Dynamics of Structures F. T. Flaherty, Jr.	75
	3-1 Types of loading, 76 3-2 Discrete systems, 79 3-3 Continuous systems, 86	

x CONTENTS

3-6 Dynamic testing, 146

3-4 Design for dynamic isolation, 106

3-5 Shock susceptibility of electronic elements, 143

	Part II THERMAL DESIGN	
Chapter 4	Fundamental Concepts in Conductive and Convective Heat Transfer	157
	C. A. Fritsch	
	 4-1 Formulation of the conduction and convection problem, 158 4-2 Transport phenomena in gases, liquids, and solids, 158 4-3 Derivation of the continuity equation, 160 4-4 Conservation of momentum—the Navier-Stokes equations, 163 4-5 The general energy equation, 166 4-6 A summary of the conduction and convection problem formulation, 163 	9
Chapter 5	Conductive Heat Transfer	171
	L. W. Dickey and C. A. Fritsch	
	5-1 Formulation of the conduction problem, 171 5-2 Thermal contact resistance, 174 5-3 Dimensionless groups in conduction, 178 5-4 Transient effects in systems due to periodic inputs, 181 5-5 The electrical-thermal analog, 189 5-6 Finite difference approach to conduction problems, 196 5-7 Summary of an approach to conduction problems, 203	
Chapter 6	Convective Heat Transfer	206
	L. W. Dickey and C. A. Fritsch	
	6-1 Dimensionless groups in convection and boundary layer concepts, 206 6-2 Analytical solution to two convection problems, 211 6-3 Techniques for approximate solutions, 223 6-4 Experimental results in convection, 226 6-5 Heat transfer by boiling liquids, 244 6-6 Extended and finned surfaces, 248 6-7 Flow through cabinets, 254 6-8 Summary for convection, 255	
Chapter 7	Radiative Heat Transfer	259
	C. A. Fritsch	
	7-1 Definition of terms, 259 7-2 Fundamental concepts, 260	

CONTENTS	хi

	7–3 Radiative characteristics of surfaces, 203 7–4 Radiative exchange between surfaces, 273 7–5 Summary of thermal radiation, 285	
Chapter 8	Thermal Design and Evaluation	287
	L. W. Dickey and C. A. Fritsch	
	 8-1 Problem definition, 289 8-2 Thermal analysis applied to the design of a typical unit, 290 8-3 Temperature measuring instruments, 309 8-4 Temperature measurements, 318 8-5 Summary of thermal design and evaluation, 322 	
	Part III ELECTRICAL INTERACTIONS	
Chapter 9	Signal Transmission	327
	R. G. Buus	
	9-1 Fundamentals of electromagnetic fields, 328 9-2 Field mapping techniques, 339 9-3 Circuit theory from field concepts, 349 9-4 Propagation of electromagnetic waves, 351 9-5 Signal transmission media, 361	
Chapter 10	Electrical Interference	381
	R. G. Buus	
	10-1 Sources of interference, 381 10-2 Methods of interference coupling, 384 10-3 Electromagnetic shielding, 397 10-4 Component interference reduction, 407 10-5 Interference reduction in cables and interconnections, 412 10-6 Grounding techniques to reduce interference, 416 10-7 DC power distribution, 426 10-8 Interference measurements, 434 10-9 Summary for electrical interactions, 436	
	Part IV HUMAN FACTORS IN DESIGN	
Chapter 11	Human Characteristics	441
	R. Hammell	
	11-1 Light and vision, 442 11-2 Hearing, speech, and sound, 466	

xii CONTENTS

	11-3 Central processes, 484	
	11-4 Other human characteristics, 490	
	11-5 Effects of environment on man, 499	
	11-6 Experimenting with people, 506	
	11-7 User preference engineering, 512	
Chapter 12	Man-Machine Interaction	520
	S. Glazer and R. Hammell	
	12-1 Man as a system element, 523	
	12-2 Design for the operator, 527	
	12-3 Design for installation and maintenance, 565	
	12-4 Design for appearance, 576	
Appendix A	Supplemental Charts and Tables for Part I—	
	Statics and Dynamics of Structures	593
Appendix B	Supplemental Tables for Part II—Thermal Design	603
Appendix C	Symbols, Units, Subscripts, and Physical Constants for Vol. I	608
	Index	615