

INTRODUCTION TO ERGONOMICS
Sixth Edition



## Contents

Foreword: the sixth edition

About the author

i ne	first p	X1X	
		section <b>I</b>	
		The human body	
1	Body	sizes	3
	1.1	Our Earth's populations	3
	1.2	Measurements	3
	1.3	Designing to fit the body	24
2	Mobility		31
	2.1	Work in motion	31
	2.2	Body joints	33
	2.3	Designing for mobility	43
	2.4	Workspaces	45
3	Muso	cular work	53
	3.1	Physiological principles	53

xiii

xvii

4	Body	strength and load handling	69
	4.1	Static and dynamic strength exertions	70
	4.2	Maximal or minimal strength exertion	71
	4.3	Hand strength	72
	4.4	Whole body strength	75
	4.5	Designing for easy load handling	89
		SECTION [[	
		The human mind	
5	How	we see	103
	5.1	Our eyes	103
	5.2	Seeing the environment	105
	5.3	Dim and bright viewing conditions	113
6	How	we hear	121
	6.1	Our ears	121
	6.2	Hearing sounds	123
	6.3	Noise and its effects	129
7	How	we sense objects and energy	141
	7.1	Sensing body movement	141
	7.2	The feel of objects, energy, and pain	143
	7.4	Designing for tactile perception	146
8		we experience indoor and outside	
	climates		153
	8.1	Human thermoregulation	153

Dynamic and static efforts, strength tests

Use of muscle strength data in design

Fatigue and recovery

58

61

63

3.2

3.3

3.4

	8.2	Climate factors: temperatures, humidity,	4.0
		drafts	158
	8.3	Our personal climate	161
	8.4	Working in hot environments	165
	8.5	Working in cold environments	167
	8.6	Designing comfortable climates	170
		SECTION III	
		Body and mind working together	
9	Menta	l activities	177
	9.1	The brain-nerve network	177
	9.2	Taking up information	185
	9.3	Making decisions	189
	9.4	Actions and reactions	192
10	Hard physical work		199
	10.1	Physiological principles	199
	10.2	Energy consumption	200
	10.3	Heart rate as a measure of work demands	205
	10.4	Limits of human labor capacity	207
	10.5	Designing heavy human work	210
11	Light a	and moderate work	215
	11.1	Physiological and psychological principles	216
	11.2	Tiredness, boredom, and alertness at work	219
	11.3	Suitable postures at work	222
	11.4	Accurate, fast, skillful activities	226
12	Workl	oad and stress	235
	12.1	Stress at work	235
	12.2	Mental workload	238
	12.3	Physical workload	241
	12.4	Underload and overload	241
	12.5	Psychophysical assessments of workloads	242

## SECTION IV

## Organizing and managing work

13	Worki	ing with others	251
	13.1	Getting along with others	252
	13.2	Motivation and behavior	254
	13.3	Task demands, job rewards	258
14	The o	rganization and you	263
	14.1	Structure, policies, procedures, culture	263
	14.2	Design for motivation and performance	268
	14.3	A good place to work	271
15	Work	ing hours	277
	15.1	Circadian body rhythms	277
	15.2	Rest pauses, time off work	281
	15.3	Daily and weekly working time	283
16	Night	and shift work	291
	16.1	Need for sleep to be awake	291
	16.2	Performance and health considerations	295
	16.3	Organizing shift work	297
		section $V$	
		Human engineering	
17	Desig	ning the home	307
	17.1	Designing for mother and child	307
	17.2	Designing for impaired and elderly	
		persons	308
	17.3	Access, walkways, steps, and stairs	309
	17.4	Kitchen	319

	17.5 17.6 17.7	Bedroom, bath, and toilet Light, heating, and cooling Home office	311 312 313
18 Office design		design	317
	18.1	Office rooms	317
	18.2	Office climate	321
	18.3	Office lighting	325
	18.4	Office furniture and equipment	329
	18.5	Ergonomic design of the office workstation	335
	18.6	Designing the home office	342
19	Comp	uter design	349
	19.1	Sholes' "type-writing machine" with its	
		QWERTY keyboard	350
	19.2	From typewriter to computer keyboard	352
	19.3	Human factor considerations for	
		keyboarding	353
	19.4	Input-related anthromechanical issues	358
	19.5	Possible design solutions	359
	19.6	Design alternatives for keyboards	363
	19.7	Designing for new syntax and diction	364
	19.8	Designing "smart" software	365
	19.9	Designs combining solutions	365
20	Workp	lace design	369
	20.1	Sizing the workplace to fit the body	369
	20.2	On the feet or sitting down?	372
	20.3	Manipulating, reaching, grasping	376
	20.4	Handling loads	376
	20.5	Displays and controls	382
21	Making	g work pleasant and efficient	391
	21.1	Using our skills and interests; getting along with others at work	391
	21.2	Setting up our own work, workplace, and	
		work environment	396

The last page	405
References	407
Index	421