

## CONTENTS

	Page
<b>Preface</b>	<b>v</b>
<b>Part I Fundamentals</b>	<b>1</b>
<b>1. Light</b>	<b>3</b>
1.1 Electromagnetic radiation and light	3
1.2 Propagation of light	4
1.3 Spectral sensitivity of eye	9
1.4 Measures of radiation and light	11
1.5 Standard elements for optical control	17
Further reading	21
<b>2. Vision</b>	<b>23</b>
2.1 The eye as an optical system	23
2.2 Visual processing	25
2.3 Lighting for results	31
2.4 Modes of appearance	36
2.5 Pointers for lighting design	42
Further reading	43
<b>3. Colour</b>	<b>44</b>
3.1 The nature of colour	44
3.2 Trichromatic colorimetry	48
3.3 Surface colours	55
3.4 Colour spaces and colour solids	58
3.5 Colour rendering	60
Further reading	63
<b>4. Measurements</b>	<b>64</b>
4.1 Standards and detectors	64
4.2 Spectral measurements and colorimetry	67
4.3 Illuminance and luminance	70
4.4 Photometry	70
Further reading	79
<b>5. Lighting calculations</b>	<b>81</b>
5.1 Illuminance calculations	81
5.2 Derivation of luminous flux from luminous intensity	87
5.3 Flux transfer and inter-reflection	93
5.4 Luminance calculations	97
5.5 Discomfort glare	99
Further reading	100
<b>6. Production of radiation</b>	<b>101</b>
6.1 Sources of radiation	101
6.2 Generation of radiation	102
6.3 Production of incoherent radiation	103
6.4 Production of coherent radiation	116
Further reading	119
<b>Part II Lamps</b>	<b>121</b>
<b>7. Lamp materials</b>	<b>123</b>
7.1 Glasses	123
7.2 Ceramics	127

7.3 Metals	129
7.4 Glass-metal seals	135
7.5 Gases	137
Further reading	137
<b>8. Phosphors</b>	<b>139</b>
8.1 Methods of excitation	139
8.2 Solid luminescent materials	141
8.3 Phosphors for fluorescent lamps	145
8.4 Phosphors for colour corrected discharge lamps	153
Further reading	154
<b>9. Incandescent lamps</b>	<b>155</b>
9.1 General lighting service lamps	155
9.2 Special purpose lamps	157
9.3 Automobile and miniature lamps	161
9.4 Manufacturing methods	163
9.5 Working characteristics	167
Further reading	168
<b>10. Tungsten halogen lamps</b>	<b>169</b>
10.1 The regenerative cycle	169
10.2 Design and construction	170
10.3 Lamps for various applications	175
Further reading	182
<b>11. Fluorescent lamps</b>	<b>183</b>
11.1 Design	183
11.2 Manufacture	188
11.3 Performance	190
11.4 Applications and special types	197
Further reading	201
<b>12. Low pressure sodium lamps</b>	<b>202</b>
12.1 Design	202
12.2 Construction and manufacture	205
12.3 Performance	206
12.4 Applications	208
12.5 Future developments	209
Further reading	209
<b>13. High pressure sodium lamps</b>	<b>210</b>
13.1 Design	210
13.2 Construction and manufacture	213
13.3 Performance	217
13.4 Application and special types	221
Further reading	222
<b>14. Mercury lamps</b>	<b>224</b>
14.1 Design	224
14.2 Construction and manufacture	226
14.3 Performance	228
14.4 Special types and applications	233
Further reading	235
<b>15. Metal halide lamps</b>	<b>236</b>
15.1 General considerations	236
15.2 Glass envelope lamps (MBI and MBIF)	238
15.3 Linear source silica lamps	241
15.4 Compact source lamps	241

15.5	Photochemical lamps	246
15.6	Recent developments	247
	Further reading	247
<b>16.</b>	<b>Neon, photoflash, and xenon lamps</b>	<b>249</b>
16.1	Neon lamps	249
16.2	Photoflash lamps	251
16.3	Xenon lamps	255
	Further reading	260
<b>17.</b>	<b>Electroluminescence</b>	<b>261</b>
17.1	Electroluminescent panels	261
17.2	Light emitting films	266
17.3	Light emitting diodes	268
	Further reading	271
<b>Part III</b>	<b>Luminaires and circuits</b>	<b>273</b>
<b>18.</b>	<b>Electrical and electronic</b>	<b>275</b>
18.1	Electrical characteristics of lamps	275
18.2	Ballasts	280
18.3	Fluorescent lamp circuits	286
18.4	Discharge lamp circuits	290
18.5	Transport and emergency lighting systems	294
18.6	Installation and control of lighting systems	300
	Further reading	304
<b>19.</b>	<b>Luminaire design and manufacture</b>	<b>305</b>
19.1	Design objectives	305
19.2	Materials and production processes	308
19.3	Specifications and testing	316
19.4	Examples of design	320
	Further reading	323
<b>Part IV</b>	<b>Interior lighting</b>	<b>325</b>
<b>20.</b>	<b>The interior environment</b>	<b>327</b>
20.1	The well-tempered environment	327
20.2	Elements of environmental significance	332
20.3	Co-ordinate design features	337
	Further reading	342
<b>21.</b>	<b>Interior lighting design</b>	<b>344</b>
21.1	Lighting objectives and criteria	344
21.2	Design decisions	350
21.3	Design calculations	358
21.4	Emergency lighting	363
	Further reading	368
<b>22.</b>	<b>Lighting for commercial and public buildings</b>	<b>369</b>
22.1	Offices	369
22.2	Hotels and catering establishments	373
22.3	Teaching establishments and libraries	377
22.4	Hospital and health care buildings	381
22.5	Churches	383
	Further reading	384
<b>23.</b>	<b>Lighting for display</b>	<b>385</b>
23.1	Principles	385
23.2	Creating the ambience	388
23.3	Local display lighting	390
	Further reading	394

<b>24. Lighting for industrial buildings</b>	<b>395</b>
24.1 Principles	395
24.2 Equipment	396
24.3 General lighting design	403
24.4 Inspection lighting	405
Further reading	407
<b>25. Lighting for entertainment</b>	<b>408</b>
25.1 Lighting objectives and principles	408
25.2 Lighting equipment	409
25.3 Control equipment	413
25.4 Layouts	417
Further reading	417
<b>Part V Exterior lighting</b>	<b>419</b>
<b>26. Exterior lighting design</b>	<b>421</b>
26.1 Lighting objectives and criteria	421
26.2 Floodlighting equipment	424
26.3 Design and calculation techniques	429
Further reading	437
<b>27. Floodlighting</b>	<b>438</b>
27.1 Sign lighting	438
27.2 Lighting of vehicle parks	439
27.3 Industrial floodlighting	440
27.4 Security lighting	443
27.5 Sports lighting	444
27.6 Building floodlighting	445
Further reading	447
<b>28. Road lighting</b>	<b>448</b>
28.1 Justification	448
28.2 Principles	449
28.3 International recommendations	452
28.4 British practice	458
28.5 Tunnel lighting	460
28.6 Vehicle headlight systems	461
Further reading	462
<b>29. Navigation lighting</b>	<b>463</b>
29.1 Signs and signals	463
29.2 Road traffic	465
29.3 Rail traffic	466
29.4 Maritime traffic	467
29.5 Air traffic	468
Further reading	470
<b>Appendices</b>	<b>473</b>
<b>I Lamp data</b>	<b>473</b>
<b>II Glossary</b>	<b>481</b>
<b>References</b>	<b>489</b>
<b>Author index</b>	<b>500</b>
<b>Subject index</b>	<b>506</b>