Contents

	Pref	face to the third edition	xiii		
	Pref	face to the second edition	XV		
	Pref	Preface to the first edition			
			4		
1	History of ideas				
	1.1	Importance of history	1		
	1.2	The nature of light	2		
	1.3	Speed of light	5		
	1.4	Transverse or longitudinal waves?	6		
	1.5	Quantum theory	7		
	1.6	Instruments	9		
	1.7	Recent developments	13		
2	Waves				
	2.1	Introduction	15		
	2.2	The non-dispersive wave equation in one dimension	16		
	2.3	Dispersive waves	19		
	2.4	Complex wavenumber, frequency and velocity	21		
	2.5	Group velocity	23		
	2.6	Waves in three dimensions	25		
	2.7	Waves in inhomogeneous media	27		
	2.8	Advanced topic: propagation and distortion of a			
		wave group in a dispersive medium	31		
	2.9	Advanced topic: gravitational lenses	33		
3	Geometrical optics				
	3.1	Introduction	37		
	3.2	The philosophy of optical design	38		
	3.3	Classical optics in the Gaussian approximation	39		

reancig has kidder all faibtive outlid. Fining to a store forms

mountement now/I-yade8: Sepipholeanibit bigoteboundable. Referring of thermal

178

	3.4	Ray tracing through simple systems	43		
	3.5	The matrix formalism of the Gaussian optics of			
		axially symmetric refractive systems	48		
	3.6	Image formation	52		
	3.7	The cardinal points and planes	54		
	3.8	Aberrations	60		
	3.9	Advanced topic: the aplanatic objective	64		
		Advanced topic: the spherical Fabry-Perot resonator	67		
4	Fourier theory				
	4.1	Introduction			
	4.2	Analysis of periodic functions	72		
	4.3	Fourier analysis	74		
	4.4	Non-periodic functions	79		
	4.5	The Fourier inversion theorem	89		
	4.6	Convolution	91		
	4.7	Correlation functions	95		
5	Electromagnetic waves				
		Electromagnetism and the wave equation	99		
	5.2	Plane-wave solutions of the wave equation	102		
	5.3	Radiation	103		
	5.4	Reflexion and refraction	106		
	5.5	Incidence in the denser medium	110		
	5.6	Electromagnetic waves incident on a conductor	117		
6	Pola	rization and anisotropic media	123		
	6.1	Introduction	123		
	6.2	Polarized light in isotropic media	124		
	6.3	Production of polarized light	127		
	6.4	Wave propagation in anisotropic media	129		
	6.5	Electromagnetic waves in an anisotropic medium	132		
	6.6	Crystal optics	133		
	6.7	Uniaxial crystals	142		
	6.8	Applications of propagation in anisotropic media	145		
		Induced anisotropic behaviour	148		
7		action	152		
	7.1	Occurrence of diffraction	152		
	7.2	The scalar-wave approximation	153		
		Fresnel diffraction	164		
	74	Fresnel diffraction by linear systems	168		

	7.5	Advanced topic: X-ray microscopy	173
8	Fraunhofer diffraction and interference		
	8.1 Introduction		176
	8.2	Fraunhofer diffraction and Fourier transforms	178
	8.3	Interference	190
	8.4	Three-dimensional interference	201
	8.5	Advanced topic: inelastic scattering of thermal	
		neutrons by phonons	210
	8.6	Advanced topic: phase retrieval	212
9	Interferometry		
	9.1	Introduction	220
	9.2	Diffraction gratings	223
	9.3	Two-beam interferometry	232
	9.4	The Sagnac common-path interferometer	243
	9.5	Interference by multiple reflexions	248
	9.6	Advanced topic: Berry's phase in interferometry	258
10	Optical waveguides and modulated media		
	10.1	Electromagnetic waves in restricted systems	263
	10.2	Optical waveguides	263
		Optical fibres	272
	10.4	Propagation of waves in a modulated medium	280
11	Coh	erence	290
	11.1	Introduction	290
	11.2	Properties of real light waves	291
	11.3	Physical origin of linewidths	297
	11.4	Quantification of the concept of coherence	300
	11.5	Temporal coherence	304
	11.6	Fourier transform spectroscopy	305
	11.7	Spatial coherence	311
	11.8	Fluctuations in light beams, and classical photon statistics	317
	11.9	The application of coherence theory to astronomy	321
12	2 Image formation		
		1 Introduction	327
	12.2	2 The diffraction theory of image formation	327
		3 Resolution limit of optical instruments	337
		4 Applications of the Abbe theory: spatial filtering	345

xii

		12.5	Improving the resolution	358
		12.6	Holography	363
		12.7	Advanced topic: interferometic imaging in astronomy	373
		12.8	Advanced topic: astronomical speckle interferometry	377
	13	The	classical theory of dispersion	383
		13.1	Classical dispersion theory	383
		13.2	Rayleigh scattering	385
		13.3	Coherent scattering and dispersion	388
		13.4	Dispersion relations	397
		13.5	Advanced topic: non-linear optics	399
			Analysis of periodical and a little of the l	
	14	Qua	ntum optics and lasers	407
		14.1	Quantization of the electromagnetic field	407
		14.2	Plane-wave modes in a linear cavity	413
	The second secon	14.3	Interaction of light with matter	419
		14.4	Lasers	425
		14.5	Laser hardware	430
in the		14.6	Laser light	434
	THE RESERVE OF THE PARTY OF THE		Advanced topic: squeezed light and its applications	435
	zmateve be			102
	13		lems	443
	App	pendix	1 Bessel functions in wave optics	465
	App	pendix	2 Lecture demonstrations in Fourier optics	469
		Bibli	ography	476
			X X	483

Tell and the second designation of the second secon

The state of the s

Peter Commence of the Commence

THE CONTRACTOR OF THE PARTY OF

The giriroll's ladings importional Militarian tentering in the statement of the statement o