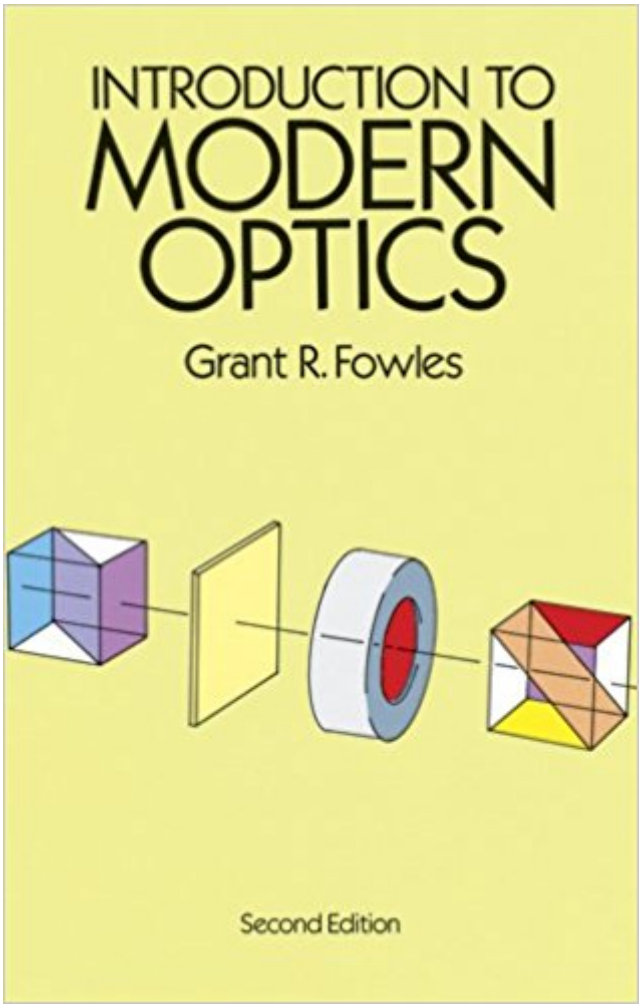
Introduction To Modern Optics (Dover Books On Physics)



Synopsis

This incisive text provides a basic undergraduate-level course in modern optics for students in physics, technology and engineering. The first half of the book deals with classical physical optics; the second principally with the quantum nature of light. Chapters 1 and 2 treat the propagation of light waves, including the concepts of phase and group velocities, and the vectorial nature of light. Chapter 3 applies the concepts of partial coherence and coherence length to the study of interference, and Chapter 4 takes up multiple-beam interference and includes Fabry-Perot interferometry and multilayer-film theory. Diffraction and holography are the subjects of Chapter 5, and the propagation of light in material media (including crystal and nonlinear optics) are central to Chapter 6. Chapters 7 and 8 introduce the quantum theory of light and elementary optical spectra, and Chapter 9 explores the theory of light amplification and lasers. Chapter 10 briefly outlines ray optics in order to introduce students to the matrix method for treating optical systems and to apply the ray matrix to the study of laser resonators.Many applications of the laser to the study of optics are integrated throughout the text. The author assumes students have had an intermediate course in electricity and magnetism and some advanced mathematics beyond calculus. For classroom use, a list of problems is included at the end of each chapter, with selected answers at the end of the book.

Book Information

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Customer Reviews

If you’re studying optics in a college class using Hecht’s classic text, or if you are an engineer who

needs an overview of the subject, this is a good practical and economical introduction to the subject. However, be aware that this book is short on two components - details of derivations of mathematical formulas and illustrations. That is not to say they do not exist, it is just to say that at several points during the book I could have been aided in my comprehension by either an illustration or derivation that simply wasn't there.There are end of chapter exercises included, and there are solutions to selected odd problems in the back of the book. However, there are no details as to how those solutions were arrived at. If you are an engineer, the only way to really be sure that you understand a subject is to solve problems. Thus I suggest Schaum's Outline of Optics by Hecht for that task. Often the solutions to problems in that outline are the mathematical details that are missing in this book!The table of contents are not included in the product description, so I add that here:Chapter 1 The Propagation of Light1.1 Elementary Optical Phenomena and the Nature of Light1.2 Electrical Consants and the Speed of Light1.3 Plane Harmonic Waves. Phase Velocity1.4 Alternative Ways of Representing Harmonic Waves1.5 Group Velocity1.6 The Doppler EffectChapter 2 The Vectorial Nature of Light2.1 General Remarks2.2 Energy Flow. The Poynting Vector2.3 Linear Polarization2.4 Circular and Elliptic Polarization2.5 Matrix Representation of Polarization. The Jones Calculus2.6 Reflection and Refraction at a Plane Boundary2.7 Amplitudes of Reflected and Refracted Waves. Fresnel's Equations2.8 The Brewster Angle2.9 The Evanescent Wave in Total Reflection2.10 Phase Changes in Total Internal Reflection2.11 Reflection MatrixChapter 3 Coherence and Interference3.1 The Principle of Linear Superposition3.2 Young's Experiment3.3 The Michelson Interferometer3.4 Theory of Partial Coherence. Visibility of Fringes3.5 Coherence Time and Coherence Length3.6 Spectral Resolution of a Finite Wave Train. Coherence and Line Width3.7 Spatial Coherence3.8 Intensity Interferometry3.9 Fourier Transform SpectroscopyChapter 4 Multiple-Beam Interference4.1 Interference with Multiple Beams4.2 The Fabry-Perot Interferometer4.3 Resolution of Fabry-Perot Instruments4.4 Theory of Multilayer FilmsChapter 5 Diffraction5.1 General Description of Diffraction5.2 Fundamental Theory5.3 Fraunhofer and Fresnel Diffraction5.4 Fraunhofer Diffraction Patterns5.5 Fresnel Diffraction Patterns5.6 Applications of the Fourier Transform to Diffraction5.7 Reconstruction of the Wave Front by Diffraction. HolographyChapter 6 Optics of Solids6.1 General Remarks6.2 Macroscopic Fields and Maxwell's Equations6.3 The General Wave Equation6.4 Propagation of Light in Isotropic Dielectrics. Dispersion6.5 Propagation of Light in Conducting Media6.6 Reflection and Refraction at the Boundary of an Absorbing Medium6.7 Propagation of Light in Crystals6.8 Double Refraction at a Boundary6.9 Optical Activity6.10 Faraday Rotation in Solids6.11 Other Magneto-optic and Electro-optic Effects6.12 Nonlinear OpticsChapter 7 Thermal Radiation and Light Quanta7.1

Thermal Radiation7.2 Kirchoff’s Law. Blackbody Radiation7.3 Modes of Electromagnetic Radiation in a Cavity7.4 Classical Theory of Blackbody Radiation. The Rayleigh-Jeans Fo7.5 Quantization of Cavity Radiation7.6 Photon Statistics. Planck’s Formula7.7 The Photoelectric Effect and the Detection of Individual Photons7.8 Momentum of a Photon. Light Pressure7.9 Angular Momentum of a Photon7.10 Wavelength of a Material Particle. de Broglie’s Hypothesis7.11 Heisenberg’s Uncertainty PrincipleChapter 8 Optical Spectra8.1 General Remarks8.2 Elementary Theory of Atomic Spectra8.3 Quantum Mechanics8.4 The SchrÃƒÂ¶dinger Equation8.5 Quantum Mechanics of the Hydrogen Atom8.6 Radiative Transitions and Selection Rules8.7 Fine Structure of Specturm Lines. Electron Spin8.8 Multiplicity in the Spectra of Many-Electron Atoms. Spectroscopic Notation8.9 Molecular Spectra8.10 Atomic-Energy Levels in SolidsChapter 9 Amplification of Light. Lasers9.1 Introduction9.2 Stimulated Emission and Thermal Radiation9.3 Amplification in a Medium9.4 Methods of Producing a Population Inversion9.5 Laser Oscillation9.6 Optical-Resonaor Theory9.7 Gas Lasers9.8 Optically Pumped Solid-State Lasers9.9 Dye Lasers9.10 Semiconductor Diode Lasers9.11 Q-Switching and Mode Locking9.12 The Ring LaserChapter 10 Ray Optics10.1 Reflection and Refraction at a Spherical Surface10.2 Lenses10.3 Ray Equations10.4 Ray Matrices and Ray Vectors10.5 Periodic Lens Waveguides and Opical ResonatorsAppendix I Relativistic Optics1.1 The Michelson-Morley Experiment1.2 Einstein’s Postulates of Special Relativity1.3 Relativistic Effects in Optics1.4 The Experiments of Sagnac and of Michelson and Gale to Detect RotationReferencesAnswers to Selected Odd-Numbered Problems

Very good overview of the theory of optics. It does require some prior knowledge and understanding of Maxwell`s eqns, and he does a good job moving you from there into the overview of each topic. He also does a good job avoiding getting overly bogged down in anything beyond the intro level. I highly recommend this book for either a review or a primer for full-on study down the road. If I had a critique, it would be that I would have liked to have seen more design examples in the ABCD matrix section.

An applied mathematician by trade (with additional training in electrical engineering), I purchased this book to fill in background information on general optics in order to prepare me to read background material and scientific papers in nonlinear optics, a subject in which I am just beginning to undertake research. My familiarity with basic optics is limited to what I learned in 100-level physics many years ago--in other words, I know essentially nothing. The book really does deliver on the promise on the backcover that all that is needed is some "advanced mathematics (beyond

calculus)" and "an intermediate course in electricity and magnetism."I found this book incredibly nice to read, with concise explanations that contain the proper amount of detail for both veteran readers and complete newbies (such as myself). The author doesn't bog the reader down with equations and long derivations, but he explains clearly how one step leads to another, allowing the reader to quickly fill in the details of the derivations, a perfect compromise for all audiences: those new to the field can learn by doing, yet with the proper guidance to prevent the process from being too frustrating, and experienced readers needing a refresher can merely read the results. Figures are well-placed and especially helpful, and notation is clear and not needlessly complicating.I highly recommend this book. Its value can't be denied; however, I'm certain that the book would compare favorably with other books costing several times more.

This is an easy 5 star. For those who gave it less, please think again:1) Title says: introduction. So don't imagine it covers every equation there is. Get Wolf's book if you like equations that much.2) Short but concise on key subjects. To do that, you have to skip a lot of intro/background or equations, that's why there are references and citations (and better bricks/bug killers).3) This is an intro book but also serves well as a refresher. This is intermediate level to advanced level for non-physicists, as it assumes good understanding of calculus.To be fair, the book is not without flaws. One obvious is the name implied recent advances (although different people use modern optics differently), while the book was last revised in 1975. Nonetheless, the key component of modern optics are mostly there, unless you are into cutting edge advances. It might be more appropriate to name it as "intro to physical optics", then again the author added a section of ray optics at the end of the book...

Excellent book for a cursory glance into the field of optics. It is a good resource if you want to gain a fundamental understanding into photonics and electromagnetism.

Struggling to find the right lens formulas or trying to design your own optics system? This book was perfect for helping me get on the right track in the lab.

It is a tiny book that has what it need to kick start any introductory course on modern optics and waves. The questions are suitable for average students. Topics and information are typical enough and into the point but it might need an instructor to explain few topics in the book for the students.

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