



**Second Edition**

**Ting-Chung Poon • Taegeun Kim**

# ENGINEERING OPTICS WITH MATLAB®

# Engineering Optics Second Edition

**Joseph W. Goodman**



## **Engineering Optics Second Edition:**

*Engineering Optics With Matlab® (Second Edition)* Ting-Chung Poon, Taegeun Kim, 2017      *Engineering Optics With Matlab®* Ting-chung Poon, Taegeun Kim, 2006-07-06 This invaluable textbook serves two purposes The first is to introduce some traditional topics such as matrix formalism of geometrical optics wave propagation and diffraction and some fundamental background on fourier optics The second is to present the essentials of acousto optics and electro optics and provide the students with experience in modeling the theory and applications using a commonly used software tool MATLAB The book is based on the authors own in class lectures as well as researches in the area      Engineering Optics Keigo Iizuka, 2008-08-02 Engineering Optics is a book for students who want to apply their knowledge of optics to engineering problems as well as for engineering students who want to acquire the basic principles of optics It covers such important topics as optical signal processing holography tomography holographic radars fiber optical communication electro and acousto optic devices and integrated optics including optical bistability Practical examples such as the video disk the Fresnel zone plate and many more appear throughout the text together with numerous solved exercises There is an entirely new section in this updated edition on 3 D imaging      **Encyclopedia of Optical and Photonic Engineering (Print) - Five Volume Set** Craig Hoffman, Ronald Driggers, 2015-09-22 The first edition of the Encyclopedia of Optical and Photonic Engineering provided a valuable reference concerning devices or systems that generate transmit measure or detect light and to a lesser degree the basic interaction of light and matter This Second Edition not only reflects the changes in optical and photonic engineering that have occurred since the first edition was published but also Boasts a wealth of new material expanding the encyclopedia s length by 25 percent Contains extensive updates with significant revisions made throughout the text Features contributions from engineers and scientists leading the fields of optics and photonics today With the addition of a second editor the Encyclopedia of Optical and Photonic Engineering Second Edition offers a balanced and up to date look at the fundamentals of a diverse portfolio of technologies and discoveries in areas ranging from x ray optics to photon entanglement and beyond This edition s release corresponds nicely with the United Nations General Assembly s declaration of 2015 as the International Year of Light working in tandem to raise awareness about light s important role in the modern world Also Available Online This Taylor E mail e reference taylorandfrancis com International Tel 44 0 20 7017 6062 E mail online sales tandf co uk      **Statistical Optics** Joseph W. Goodman, 2015-04-20 This book discusses statistical methods that are useful for treating problems in modern optics and the application of these methods to solving a variety of such problems This book covers a variety of statistical problems in optics including both theory and applications The text covers the necessary background in statistics statistical properties of light waves of various types the theory of partial coherence and its applications imaging with partially coherent light atmospheric degradations of images and noise limitations in the detection of light New topics have been introduced in the second edition including Analysis of the Vander

Pol oscillator model of laser light Coverage on coherence tomography and coherence multiplexing of fiber sensors An expansion of the chapter on imaging with partially coherent light including several new examples An expanded section on speckle and its properties New sections on the cross spectrum and bispectrum techniques for obtaining images free from atmospheric distortions A new section on imaging through atmospheric turbulence using coherent light The addition of the effects of read noise to the discussions of limitations encountered in detecting very weak optical signals A number of new problems and many new references have been added Statistical Optics Second Edition is written for researchers and engineering students interested in optics physicists and chemists as well as graduate level courses in a University Engineering or Physics Department

**Fundamentals of Infrared and Visible Detector Operation and Testing** John David Vincent, Steve Hodges, John Vampola, Mark Stegall, Greg Pierce, 2015-10-26 Presents a comprehensive introduction to the selection operation and testing of infrared devices including a description of modern detector assemblies and their operation This book discusses how to use and test infrared and visible detectors The book provides a convenient reference for those entering the field of IR detector design test or use those who work in the peripheral areas and those who teach and train others in the field Chapter 1 contains introductory material Radiometry is covered in Chapter 2 The author examines Thermal detectors in Chapter 3 the Classical photon detectors simple photoconductors and photovoltaics in Chapter 4 and Modern Photon Detectors in Chapter 5 Chapters 6 through 8 consider respectively individual elements and small arrays of elements the readouts ROICs used with large imaging arrays and Electronics for FPA Operation and Testing The Test Set and The Testing Process are analyzed in Chapters 9 and 10 with emphasis on uncertainty and trouble shooting Chapters 11 through 15 discuss related skills such as Uncertainty Cryogenics Vacuum Optics and the use of Fourier Transforms in the detector business Some highlights of this new edition are that it Discusses radiometric nomenclature and calculations detector mechanisms the associated electronics how these devices are tested and real life effects and problems Examines new tools in Infrared detector operations specifically selection and use of ROICs electronics for FPA operation operation of single element and very small FPAs microbolometers and multi color FPAs Contains five chapters with frequently sought after information on related subjects such as uncertainty optics cryogenics vacuum and the use of Fourier mathematics for detector analyses Fundamentals of Infrared and Visible Detector Operation and Testing Second Edition provides the background and vocabulary necessary to help readers understand the selection operation and testing of modern infrared devices

**Handbook of Imaging Materials** Arthur S. Diamond, 2018-10-08 Presents the most recent developments in the materials properties and performance characteristics of photographic electrophotographic electrostatic diazo and ink jet imaging processes Provides current techniques and modern applications for ink jet thermal and toner related imaging systems

**Nondestructive Evaluation** Peter J. Shull, 2002-05-08 Describing NDE issues associated with real world applications this comprehensive book details conventional and forthcoming NDE technologies It instructs on current

practices common techniques and equipment applications and the potentials and limitations of current NDE methods Each chapter details a different method providing an overview an e **Aero-Optical Effects** Stanislav Gordeyev, Eric J. Jumper, Matthew R. Whiteley, 2023-01-04 AERO OPTICAL EFFECTS Explore the newest techniques and technologies used to mitigate the effects of air flow over airborne laser platforms Aero Optical Effects Physics Analysis and Mitigation delivers a detailed and insightful introduction to aero optics and fully describes the current understanding of the physical causes of aero optical effects from turbulent flows at different speeds In addition to presenting a thorough discussion of instrumentation data reduction and data analysis the authors examine various approaches to aero optical effect mitigation using both flow control and adaptive optics approaches The book explores the sources characteristics measurement approaches and mitigation means to reduce aero optics wavefront error It also examines the precise measurements of aero optical effects and the instrumentation of aero optics Flow control for aero optical applications is discussed as are approaches like passive flow control active and hybrid flow control and closed loop flow control Readers will benefit from discussions of the applications of aero optics in relation to fields like directed energy and high speed communications Readers will also enjoy a wide variety of useful features and topics including Comprehensive discussions of both aero effects which include the effects that air flow has over a beam director mounted on an aircraft and aero optics which include atmospheric effects that degrade the ability of an airborne laser to focus a beam A treatment of air buffeting and its effects on beam stabilization and jitter An analysis of mitigating impediments to the use of high quality laser beams from aircraft as weapons or communications systems Adaptive optics compensation for aero optical disturbances Perfect for researchers engineers and scientists involved with laser weapon and beam control systems Aero Optical Effects Physics Analysis and Mitigation will also earn a place in the libraries of principal investigators in defense contract work and independent research and development *Dynamic Laser Speckle and Applications* Hector J. Rabal, Roberto A. Braga Jr., 2018-10-03 Speckle study constitutes a multidisciplinary area with inherent complexities In order to conquer challenges such as the variability of samples and sensitive measurements researchers must develop a theoretical and statistical understanding of both biological and non biological metrology using dynamic speckle laser Dynamic Laser Speckle and Applications discusses the main methodologies used to analyze biospeckle phenomena with a strong focus on experimentation After establishing a theoretical background in both speckle and biospeckle the book presents the main methodologies for statistical and image analysis It then deals with the concept of frequency decomposition before moving on to a discussion of fuzzy methods to treat dynamic speckle data The book dedicates two sections to applications including agricultural approaches Additional features include photo images of experiments and software to aid in easy start up of dynamic speckle usage A systematic approach to new dynamic speckle laser phenomena this book provides the physical theory and statistical background needed to analyze images formed by laser illumination in biological and non biological samples **Electromagnetic Theory and**

**Applications for Photonic Crystals** Kiyotoshi Yasumoto, 2018-10-03 Photonic technology promises much faster computing massive parallel processing and an evolutionary step in the digital age The search continues for devices that will enable this paradigm and these devices will be based on photonic crystals Modeling is a key process in developing crystals with the desired characteristics and performance and Electromagnetic Theory and Applications for Photonic Crystals provides the electromagnetic theoretical models that can be effectively applied to modeling photonic crystals and related optical devices The book supplies eight self contained chapters that detail various analytical numerical and computational approaches to the modeling of scattering and guiding problems For each model the chapter begins with a brief introduction detailed formulations of periodic structures and photonic crystals and practical applications to photonic crystal devices Expert contributors discuss the scattering matrix method multipole theory of scattering and propagation model of layered periodic arrays for photonic crystals the multiple multipole program the mode matching method for periodic metallic structures the method of lines the finite difference frequency domain technique and the finite difference time domain technique Based on original research and application efforts Electromagnetic Theory and Applications for Photonic Crystals supplies a broad array of practical tools for analyzing and designing devices that will form the basis for a new age in computing

**Handbook of Optical Interconnects** Shigeru Kawai, 2018-10-03 As we reach the data transmission limits of copper wire and communications experts seek to bring the speed of long haul fiber optics networks closer to access points optical interconnects promise to provide efficient high speed data transmission for the next generation of networks and systems They offer higher bit rates virtually no crosstalk lower demands on power requirements and thermal management and the possibility of two dimensional channel arrays for chip to chip communication The Handbook of Optical Interconnects introduces the systems and devices that will bring the speed and quality of optical transmission closer to the circuit board Contributed by active experts most from leading technology companies in the US and Japan this outstanding handbook details various low cost and small size configurations illustrates the discussion with more than 300 figures and offers a look at the applications and future of this exciting and rapidly growing field The book includes a detailed introduction to vertical cavity surface emitting lasers VCSELs the use of optical interconnects in metropolitan local area and access networks through FTTP FTTH and Jisso technologies which are critical for developing low cost small size modules Driving down the size and cost of optical interconnects is vital for integrating these technologies into the network and onto microprocessors and the Handbook of Optical Interconnects provides the knowledge and tools necessary to accomplish these goals

**Near-Earth Laser Communications** Hamid Hemmati, 2018-10-03 Invented more than a hundred years ago by Alexander Graham Bell the technology of free space optical communications or lasercom has finally reached the level of maturity required to meet a growing demand for operational multi giga bit per second data rate systems communicating to and from aircrafts and satellites Putting the emphasis on near earth links including air LEO MEO and GEO orbits Near Earth

Laser Communications presents a summary of important free space laser communication subsystem challenges and discusses potential ways to overcome them This comprehensive reference provides up to date information on component and subsystem technologies fundamental limitations and approaches to reach those limits It covers basic concepts and state of the art technologies emphasizing device technology implementation techniques and system trades The authors discuss hardware technologies and their applications and also explore ongoing research activities and those planned for the near future The analytical aspects of laser communication have been covered to a great extent in several books However a detailed approach to system design and development including trades on subsystem choices and implications of the hardware selection for satellite and aircraft telecommunications is missing Highlighting key design variations and critical differences between them this book distills decades worth of experience into a practical resource on hardware technologies

**Introduction to Nonimaging Optics** Julio Chaves,2008-05-22 The world s insatiable consumption of energy must be met with new technologies that offer alternative environmentally conscious sources of light and power The relatively young field of nonimaging optics is an ideal tool for designing optimized solar energy collectors and illumination optics and holds great promise in the development of solid stat *Rare-Earth-Doped Fiber Lasers and Amplifiers, Revised and Expanded* Michel J.F. Dignonnet,2001-05-31 Rare Earth Doped Fiber Lasers and Amplifiers Second Edition discusses the essential principles operating characteristics and current technology of the main fiber laser and amplifier devices based on rare earth doped silica and fluorozirconate fibers Covering all aspects of this revolutionary technology the book reviews fiber fabrication methods and the basic spectroscopic properties of rare earth ions in glasses concentrates on the most important fiber laser sources examines several advances in fiber amplifiers and analyzes new findings and improvements in single frequency operation frequency tenability broadband fiber sources and blue green and far infrared fiber lasers **Fiber Optic Sensors** Shizhuo Yin,Paul B. Ruffin,Francis T.S. Yu,2017-12-19 The need for both intrinsic and extrinsic fiber optic sensor technologies continues to grow To meet the demands of this fast expanding applications driven market Fiber Optic Sensors Second Edition presents both the latest advances in fiber optic sensor technology such as the application of photonic crystal fibers to fiber optic gyroscopes and recent application opportunities including the use of fiber optic sensors as a minimally invasive medical treatment The new edition of this seminal work highlights the development of fiber optic sensors while providing an overview of current methods for the construction of high speed and high capacity fiber optic systems Two new chapters cover topics such as femtosecond laser illumination inscription and the growing application sector of fiber optic chemical and biological sensors Adding significant new material the book continues to provide a progressive history of each sensor type as well as basic principles and fundamental building blocks for practical applications in the electrical aerospace defense and manufacturing smart structure undersea surveillance medical and gas and oil industries **Light Propagation in Periodic Media** Michel Nevieri,Evgeny Popov,2018-10-03 Based on more than 30 years of research on differential

theories of gratings this book describes developments in differential theory for applications in spectroscopy acoustics X ray instrumentation optical communication information processing photolithography high power lasers high precision engineering and astronomy Introducing the Fast Fourier Factorization approach to improve the convergence of a truncated series the book examines multilayers stacked gratings crossed gratings photonic crystals and isotropic and anisotropic materials techniques and examples in grating design and Maxwell equations in a truncated Fourier space

**Gas Lasers** Masamori Endo, Robert F. Walter, 2018-10-03 Lasers with a gaseous active medium offer high flexibility wide tunability and advantages in cost beam quality and power scalability Gas lasers have tended to become overshadowed by the recent popularity and proliferation of semiconductor lasers As a result of this shift in focus details on modern developments in gas lasers are difficult to find In addition different types of gas lasers have unique properties that are not well described in other references Collecting expert contributions from authorities dealing with specific types of lasers Gas Lasers examines the fundamentals current research and applications of this important class of laser It is important to understand all types of lasers from solid state to gaseous before making a decision for any application This book fills in the gaps by discussing the definition and properties of gaseous media along with its fluid dynamics electric excitation circuits and optical resonators From this foundation the discussion launches into the basic physics characteristics applications and current research efforts for specific types of gas lasers CO lasers CO<sub>2</sub> lasers HF DF lasers excimer lasers iodine lasers and metal vapor lasers The final chapter discusses miscellaneous lasers not covered in the previous chapters Collecting hard to find material into a single convenient source Gas Lasers offers an encyclopedic survey that helps you approach new applications with a more complete inventory of laser options

**Holography and Deformation Analysis** W. Schumann, J.-P. Zürcher, D. Cuhe, 2013-04-17 In this book series on Optical Sciences holography has been the subject of three previous volumes In particular Vol 16 written by one of us W S and Dr M Dubas treated holographic interferometry of opaque bodies from the standpoint of deformation analysis However the fundamental principles of holography are developed there only briefly in preparation for a discussion of interference fringe modifications This new volume in the series is intended to consider in detail many topics which were previously omitted such as the deformation or distortion of holographic images the theory of volume holograms composite or multiplex holography holographic interferometry of transparent media time dependent effects holographic contouring and applications of fringe modifications to the deformation of opaque bodies In addition these and other subjects will be treated with the same unifying concept developed in Vol 16 but with an additional emphasis on those features that have their origins in classical optics especially the small wavelength approach the coupled wave theory and the Seidel aberrations Since the field of holography and its various applications is growing rapidly it is impossible to be comprehensive in a single book Every effort has been made to avoid unnecessary duplication of Vol 16 For example displacement and fringe localization problems are only briefly discussed while some modification techniques e.g sandwich holography



are not included When needed however the reader is directly referred to complementary publications      **Introduction to Laser Physics** K. Shimoda, 2013-11-11 To Laser Physics With 87 Figures Springer Verlag Berlin Heidelberg GmbH 1984 Professor Koichi Shimoda Faculty of Science and Technology Keio University 3 14 1 Hiyoshi Kohokuku Yokohama 223 Japan ARTHUR L SCHAWLOW Ph D Editorial Board Department of Physics Stanford University Stanford CA 94305 USA JAY M ENOCH Ph D Professor KOICHI SHIMODA School of Optometry Faculty of Science and Technology University of California Keio University 3 14 1 Hiyoshi Kohoku ku Berkeley CA 94720 USA Yokohama 223 Japan DAVID L MACADAM Ph D THEODOR TAMIR Ph D 68 Hamrond Street 981 East Lawn Drive Rochester NY 14615 USA Teaneck NJ 07666 USA Revised translation of the original Japanese edition Koichi Shimoda Reza Butsuri Nyumon Koichi Shimoda 1983 Originally published in Japanese by Iwanami Shoten Publishers Tokyo 1983 English translation by Munetada Yamamuro ISBN 978 3 662 13550 1 ISBN 978 3 662 13548 8 eBook DOI 10 1007 978 3 662 13548 8 Library of Congress Cataloging in Publication Data Shimoda K ichi Introduction to laser physics Springer series in optical sciences v 44 Rev translation of Koichi Shimoda Reza Butsuri Ny11mon 1 Lasers 1 Title H Series QC688 S55 1984 535 5 8 84 5629 This work is subject to copyright All rights are reserved whether the whole or part of the material is concemed specifically those of translation reprinting reuse of illustrations broadcasting reproduction by photocopying machine or similar means and storage in data banks Under sect 54 of the German Copyright Law where copies are made for other than private use a fee is payable to Verwertungsgesellschaft Wort Munich

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