

# Introduction To Lens Design With Practical Zemax Examples

This second edition features new and expanded coverage of contaminant hydrogeologic investigations. It presents a practical approach to completing investigations for environmental compliance, emphasizing the use of geologic principles in assessment to move sites toward cleanup. Stressing the basics of collecting data that can withstand regulatory scrutiny and achieve remediation, *Principles of Contaminant Hydrogeology, Second Edition* demonstrates how to solve a client's site contamination problem while maximizing cost effectiveness. It focuses on small- and medium-sized firms, for which speed, accuracy, and cost are all crucial factors in the site assessment and closure process. Based on "real world" problems, the book takes you step-by-step through the investigation and includes client-consultant-regulator interaction, budgets, ethics, and data extrapolation for solving problems. It introduces concepts such as field logistics, drilling techniques, sampling protocols, contaminant movement, and remediation. Regulatory personnel, hydrogeological consultants, drilling contractors, remediation contractors, university instructors, and students will benefit from the wealth of information provided in this new edition.

A complete basic undergraduate course in modern optics for students in physics, technology, and engineering. The first half deals with classical physical optics; the second,

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quantum nature of light. Solutions.

Good game design happens when you view your game from as many perspectives as possible. Written by one of the world's top game designers, *The Art of Game Design* presents 100+ sets of questions, or different lenses, for viewing a game's design, encompassing diverse fields such as psychology, architecture, music, visual design, film, software engineering, theme park design, mathematics, puzzle design, and anthropology. This Second Edition of a Game Developer Front Line Award winner: Describes the deepest and most fundamental principles of game design Demonstrates how tactics used in board, card, and athletic games also work in top-quality video games Contains valuable insight from Jesse Schell, the former chair of the International Game Developers Association and award-winning designer of Disney online games *The Art of Game Design, Second Edition* gives readers useful perspectives on how to make better game designs faster. It provides practical instruction on creating world-class games that will be played again and again. *Contemporary Scleral Lenses: Theory and Application*, provides comprehensive information about scleral lenses. Chapters of this volume have been contributed by renowned scleral lens experts and cover a variety of interesting topics. These topics include the history and evolution of scleral lenses, basic scleral lens structure, optics and customizable features of scleral lenses, analysis of ocular surface shape, ocular surface topography and advances in optometry technology. These topics give readers an explanation of how to

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utilize diagnostic equipment in optometry practice and enables practitioners to employ a scientific and objective approach to scleral lens fitting. Key features of this volume include: - A straightforward approach to ophthalmic examination flow, evaluation and documentation - A review of Scleral lens care and handling - Descriptions of a variety of complex medical and ocular indications for scleral lenses - Strategic tips to promote your own scleral lens practice - A unique perspective of esteemed corneal specialists regarding the collaborative care of the patient This textbook is a suitable reference for ophthalmology students and practitioners. This text will assist practitioners in enhancing their scleral lens practice by providing them useful information for improving patient vision, ocular surface rehabilitation and quality of life.

A Course in Lens Design is an instruction in the design of image-forming optical systems. It teaches how a satisfactory design can be obtained in a straightforward way. Theory is limited to a minimum, and used to support the practical design work. The book introduces geometrical optics, optical instruments and aberrations. It gives a description of the process of lens design and of the strategies used in this process. Half of its content is devoted to the design of sixteen types of lenses, described in detail from beginning to end. This book is different from most other books on lens design because it stresses the importance of the initial phases of the design process: (paraxial) lay-out and (thin-lens) pre-design. The argument for this change of accent is that in these phases much information can be obtained about

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the properties of the lens to be designed. This information can be used in later phases of the design. This makes *A Course in Lens Design* a useful self-study book and a suitable basis for an introductory course in lens design. The mathematics mainly used is college algebra, in a few sections calculus is applied. The book could be used by students of engineering and technical physics and by engineers and scientists.

*Shoah and Torah* systematically takes up the task of reading the Shoah through the lens of the Torah and the Torah through the lens of the Shoah. The investigation rests upon (1) the metaphysical standing that the Nazis ascribed to the Torah, (2) the obliteration of the Torah in the extermination of the Jews, (3) the significance of the Torah for an understanding of the Shoah, and (4) the significance of the Shoah for an understanding of the Torah. The basis for the inquiry lies not in the content of a certain belief but in the categories of a certain mode of thought. Distinct from all other studies, this book is grounded in the categories of Jewish thought and Judaism—the categories of creation, revelation, and redemption—that the Nazis sought to obliterate in the Shoah. Thus, the investigation is itself a response to the Nazi project of the extermination of the Jews and the millennial testimony of the Jews to the Torah.

Designing an efficient imaging system for biomedical optics requires a solid understanding of the special requirements of the optical systems for biomedical imaging and the optical components used in the systems. However, a lack of reference books on optical design (imaging and illumination) for biomedical imaging

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has led to some inefficient systems. This book fills the gap between biomedical optics and optical design by addressing the fundamentals of biomedical optics and optical engineering, and biomedical imaging systems. The first half provides a brief introduction to biomedical optics and then covers the fundamentals of optics, optical components, light sources, detectors, optical imaging system design, and illumination system design. This also includes important issues related to biomedical imaging, such as autofluorescence from optical materials. The second half of the text covers various biomedical imaging techniques and their optical systems, along with design examples.

Classic detailed treatment for practical designer.

Fundamental concepts, systematic study and design of all types of optical systems. Reader can then design simpler optical systems without aid. Part Two of Two.

A Practical Guide to Lens Design focuses on the very detailed practical process of lens design. Every step from setup specifications to finalizing the design for production is discussed in a straight forward, tangible way. Design examples of several widely used modern lenses are provided. Optics basics are introduced and basic functions of Zemax are described. Zemax will be used throughout the book.

Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples – ranging from simple lenses to complex zoom lenses and mirror

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systems – give insight for both the newcomer and specialist in the field. Rudolf Kingslake is regarded as the American father of lens design; his book, not revised since its publication in 1978, is viewed as a classic in the field. Naturally, the area has developed considerably since the book was published, the most obvious changes being the availability of powerful lens design software packages, theoretical advances, and new surface fabrication technologies. This book provides the skills and knowledge to move into the exciting world of contemporary lens design and develop practical lenses needed for the great variety of 21st-century applications. Continuing to focus on fundamental methods and procedures of lens design, this revision by R. Barry Johnson of a classic modernizes symbology and nomenclature, improves conceptual clarity, broadens the study of aberrations, enhances discussion of multi-mirror systems, adds tilted and decentered systems with eccentric pupils, explores use of aberrations in the optimization process, enlarges field flattener concepts, expands discussion of image analysis, includes many new exemplary examples to illustrate concepts, and much more. Optical engineers working in lens design will find this book an invaluable guide to lens design in traditional and emerging areas of application; it is also suited to advanced undergraduate or graduate course in lens design principles and as a self-learning tutorial and reference for the practitioner. Rudolf Kingslake (1903-2003) was a founding faculty member of the Institute of Optics at The University of Rochester (1929) and remained teaching until 1983. Concurrently, in 1937

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he became head of the lens design department at Eastman Kodak until his retirement in 1969. Dr. Kingslake published numerous papers, books, and was awarded many patents. He was a Fellow of SPIE and OSA, and an OSA President (1947-48). He was awarded the Progress Medal from SMPTE (1978), the Frederic Ives Medal (1973), and the Gold Medal of SPIE (1980). R. Barry Johnson has been involved for over 40 years in lens design, optical systems design, and electro-optical systems engineering. He has been a faculty member at three academic institutions engaged in optics education and research, co-founder of the Center for Applied Optics at the University of Alabama in Huntsville, employed by a number of companies, and provided consulting services. Dr. Johnson is an SPIE Fellow and Life Member, OSA Fellow, and an SPIE President (1987). He published numerous papers and has been awarded many patents. Dr. Johnson was founder and Chairman of the SPIE Lens Design Working Group (1988-2002), is an active Program Committee member of the International Optical Design Conference, and perennial co-chair of the annual SPIE Current Developments in Lens Design and Optical Engineering Conference. Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples – ranging from simple lenses to complex zoom lenses and mirror systems – give insight for both the newcomer and specialist in the field

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A good understanding of the optical principles behind contact lenses and their surface design is essential for successful contact lens fitting. This book provides an ideal introduction and in clear and straightforward terms covers the topics in order to increase the awareness of what is being attempted and what can be achieved in clinical practice. Essential reading for all undergraduate optometry students, 'Contact Lens Optics and Lens Design Second Edition' is also intended to extend the abilities of contact lens practitioners in coping with the problems of everyday contact lens fitting.

Mathematical Modelling sets out the general principles of mathematical modelling as a means comprehending the world. Within the book, the problems of physics, engineering, chemistry, biology, medicine, economics, ecology, sociology, psychology, political science, etc. are all considered through this uniform lens. The author describes different classes of models, including lumped and distributed parameter systems, deterministic and stochastic models, continuous and discrete models, static and dynamical systems, and more. From a mathematical point of view, the considered models can be understood as equations and systems of equations of different nature and variational principles. In addition to this, mathematical features of mathematical models, applied control and optimization problems based on mathematical models, and identification of mathematical models are also presented. Features Each chapter includes four levels: a lecture (main chapter material), an appendix (additional information), notes (explanations, technical calculations, literature review) and tasks for

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independent work; this is suitable for undergraduates and graduate students and does not require the reader to take any prerequisite course, but may be useful for researchers as well. Described mathematical models are grouped both by areas of application and by the types of obtained mathematical problems, which contributes to both the breadth of coverage of the material and the depth of its understanding. Can be used as the main textbook on a mathematical modelling course, and is also recommended for special courses on mathematical models for physics, chemistry, biology, economics, etc. Introduction to Lens Design Cambridge University Press. This book presents an in-depth look at lenses free of spherical aberrations and is provided using illustrative examples. Mathematical principles behind lenses free of spherical aberration are included with an introduction to set theory, the conics, continuity, real analysis and topology. Physical principles are covered as well as a step by step guide to mathematical model for deducing the general formula of the stigmatic lens, in order to design a singlet free of spherical aberration.

Subsequently, the characteristics of these lenses and the equations that describes them are studied. Finally, several implications of these lenses are studied, such as freeform lenses, optical systems, axicons, telescopes and more. Scenarios with on-axis objects and off-axis objects are considered. Cases where the object is real or virtual, and the image is real or virtual are also presented. The book is a valuable resource for industrial specialists and academics in lens design and optics, and an insightful guide for optical physics students.

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This comprehensive and self-contained text for researchers and professionals presents a detailed account of optical imaging from the viewpoint of both ray and wave optics.

There is no shortage of lens optimization software on the market to deal with today's complex optical systems for all sorts of custom and standardized applications. But all of these software packages share one critical flaw: you still have to design a starting solution. Continuing the bestselling tradition of the author's previous books, *Lens Design, Fourth Edition* is still the most complete and reliable guide for detailed design information and procedures for a wide range of optical systems. Milton Laikin draws on his varied and extensive experience, ranging from innovative cinematographic and special-effects optical systems to infrared and underwater lens systems, to cover a vast range of special-purpose optical systems and their detailed design and analysis. This edition has been updated to replace obsolete glass types and now includes several new designs and sections on stabilized systems, the human eye, spectrographic systems, and diffractive systems. A new CD-ROM accompanies this edition, offering extensive lens prescription data and executable ZEMAX files corresponding to figures in the text. Filled with sage advice and completely illustrated, *Lens Design, Fourth Edition* supplies hands-on guidance for the initial design and final optimization for a plethora of commercial, consumer, and specialized optical systems.

*Optical System Design* covers the basic knowledge of optics and the flow of light through an optical system. This book is

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organized into 16 chapters that deal with various components of an optical system, from light and images to spectroscopic apparatus. The book first discusses the simple components of an optical system, including its light, lens, oblique beams, and photochemical aspects. It then deals with the system's projection, plane mirrors, prisms, magnifying instruments, and telescope. Other components considered are the surveying instruments, mirror imaging systems, photographic optics, and spectroscopic apparatus. This book is of value to undergraduate students with courses in geometrical optics and system design.

Local governments use their control over land use to generate race and class segregation, benefitting white property owners.

A concise introduction to lens design, including the fundamental theory, concepts, methods and tools used in the field. Covering all the essential concepts and providing suggestions for further reading at the end of each chapter, this book is an essential resource for graduate students working in optics and photonics.

Prism and Lens Making: A Textbook for Optical Glassworkers, Second Edition is a unique compendium of the art and science of the optical working of glass for the production of mirrors, lenses, and prisms. Incorporating minor corrections and a foreword by Professor Walter Welford FRS, this reissue of the 1957 edition provides a wealth of technical information and hands-on guidance gained from a lifetime of experience. Although some of the techniques have been replaced by more modern methods, this classic book is still a valuable source of practical assistance as well as being a pleasure to read. About the Author Frank Twyman was a skilled craftsman in all aspects of optics. He joined Otto Hilger in 1898 to work on the production of simple spectroscopes costing less than £10 each. After the death of Otto Hilger,

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Twyman became Managing Director of Adam Hilger Ltd., a company known for the finest quality optical and mechanical work. He worked here from 1902 to 1946 and was very concerned with the practical aspects of instrument making; he designed many of the instruments himself and constantly strove to improve the techniques of optical grinding and polishing. In 1916 Twyman and Alfred Green, the foreman of the Hilger optical shops, patented the now-famous prism and lens testing interferometer that bears their names. Twyman also undertook fundamental studies in the annealing process for glass and invented new spectrophotometers and spectrographs.

Electrostatic Lens Systems: Second Edition enables readers to design lens systems for focusing beams of charged particles that have useful characteristics. The book covers the basic theory of the motion of charged particles in electrostatic fields and describes several methods for the calculation of the potential and field distribution for various electrode geometries. It emphasizes the Bessel function expansion method, developed by the author and his students, and the nine-point implementation of the finite difference method. Demonstration programs of other methods can be found via the websites provided. A chapter on aberrations presents formulae that enable the coefficients to be determined by an extension to the ray tracing procedures, demonstrating optimum conditions for lens operation. The book is accompanied by a disk that provides a suite of computer programs (LENSYS for MS-DOS) intended for practical use in the design and analysis of systems using round lenses with apertures or cylindrical elements. These programs are of value even to experienced workers in the field who may be quite familiar with much of the material in the text. Discussions on the importance and impact of pedagogical practice on students as whole persons are often concentrated

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on the P-12 or undergraduate learning experience. In higher education, many institutions do an outstanding job of complicating the undergraduate classroom to include civic engagement, community-based learning, education abroad, social action, and project-based learning. But, what about the graduate classroom? While there are indeed numerous graduate programs that push students to interact with strong, meaningful, difficult, and sometimes harsh facts, scholarship, and ideologies, the instructional methods have largely remained stagnant. New methods of constructing deep and meaningful learning in graduate education is essential for the transformation and continued evolution of graduate school instruction. *Reshaping Graduate Education Through Innovation and Experiential Learning* is a crucial reference book that offers practice-based reflections on efforts to infuse creativity, social action, engaged learning, or other creative interventions into the graduate classroom. The book includes personal narratives that are grounded in pedagogical perspectives from graduate school instructors who share their experiences with innovative and transformative teaching practices. The goal of the book is to encourage graduate school professors to engage social justice education as something to be experienced and practiced in their courses and not just as a concept to be studied. As such, the book covers topics such as self-directed learning, counseling, and community mapping. It is ideal for graduate-level instructors in the field of education and other related social science areas, as well as junior faculty as they establish a teaching practice or veteran faculty seeking creative transformation. The process of designing lenses is both an art and a science. While advancements in the field over the past two centuries have done much to transform it from the former category to the latter, much of the lens design process remains encapsulated in the experience and knowledge of industry

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veterans. This Field Guide provides a working reference for practicing physicists, engineers, and scientists for deciphering the nuances of basic lens design. The book begins with an outline of the general process before delving into aberrations, basic lens design forms, and optimization. An entire section is devoted to techniques for improving lens performance.

Sections on tolerancing, stray light, and optical systems are followed by an appendix covering related topics such as optical materials, nonimaging concepts, designing for sampled imaging, and ray tracing fundamentals.

Unlike the first edition, which was more a collection of lens designs for use in larger projects, the 2nd edition of *Modern Lens Design* is an optical "how-to." Delving deep into the mechanics of lens design, optics legend Warren J. Smith reveals time-tested methods for designing top-quality lenses.

He deals with lens design software, primarily OSLO, by far the current market leaders, and provides 7 comprehensive worked examples, all new to this edition. With this book in hand, there's no lens an optical engineer can't design.

*Contact Lens Design Tables* presents tables for the determination of surface radii of curvature of hard contact lenses to give a required axial edge lift. The book also offers method of use of these tables to achieve the best approach to their use in lens design. These tables will be helpful to contact lens practitioners and manufacturers.

"Given the many different applications and uses of diffractive optics, the importance of this field cannot be underestimated. This book supplements the available literature on diffractive optic elements (DOEs) by equipping readers with the skills to begin designing, simulating, and fabricating diffractive optics. The design

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of DOEs is presented with simple equations and step-by-step procedures for simulation--from the simplest 1D grating to the more complex multifunctional DOEs--and analyzing their diffraction patterns using MATLAB. The fundamentals of fabrication techniques such as photolithography, electron beam lithography, and focused ion beam lithography with basic instructions for the beginner are presented. Basic error analysis and error-correction techniques for a few cases are also discussed. The contents of all the chapters are supported throughout by practical exercises and clearly commented MATLAB® codes (the codes are also on an accompanying CD), making this book useful even to a novice programmer"--

The lens is generally the most expensive and least understood part of any camera. In this book, Rudolf Kingslake traces the historical development of the various types of lenses from Daguerre's invention of photography in 1839 through lenses commonly used today. From an early lens still being manufactured for use in low-cost cameras to designs made possible through such innovations as lens coating, rare-earth glasses, and computer aided lens design and testing, the author details each major advance in design and fabrication. The book explains how and why each new lens type was developed, and why most of them have since been abandoned. This authoritative history of lens technology also includes brief biographies of several outstanding lens designers and manufacturers of the past.

No single volume has been entirely devoted to the

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properties of magnetic lenses, so far as I am aware, although of course all the numerous textbooks on electron optics devote space to them. The absence of such a volume, bringing together information about the theory and practical design of these lenses, is surprising, for their introduction some fifty years ago has created an entirely new family of commercial instruments, ranging from the now traditional transmission electron microscope, through the reflection and transmission scanning microscopes, to columns for micromachining and microlithography, not to mention the host of experimental devices not available commercially. It therefore seemed useful to prepare an account of the various aspects of magnetic lens studies. These divide naturally into the five chapters of this book: the theoretical background, in which the optical behaviour is described and formulae given for the various aberration coefficients; numerical methods for calculating the field distribution and trajectory tracing; extensive discussion of the paraxial optical properties and aberration coefficients of practical lenses, illustrated with curves from which numerical information can be obtained; a complementary account of the practical, engineering aspects of lens design, including permanent magnet lenses and the various types of superconducting lenses; and finally, an up-to-date survey of several kinds of highly unconventional magnetic lens, which may well change the appearance of future electron optical instruments very considerably after they cease to be unconventional. In this thoroughly revised and updated third edition of *Contact Lens Practice*, award-winning author, researcher

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and lecturer, Professor Nathan Efron, provides a comprehensive, evidence-based overview of the scientific foundation and clinical applications of contact lens fitting. The text has been refreshed by the inclusion of ten new authors – a mixture of scientists and clinicians, all of whom are at the cutting edge of their specialty. The chapters are highly illustrated in full colour and subject matter is presented in a clear and logical format to allow the reader to quickly hone in the desired information. Ideal for an optometrist, ophthalmologist, orthoptist, optician, student, or work in the industry, this book will serve as an essential companion and guide to current thinking and practice in the contact lens field. Highlights of this edition include a new chapter on myopia control contact lenses, as well as completely rewritten chapters, by new authors, on keratoconus, orthokeratology, soft and rigid lens measurement and history taking.

QUICKLY AND EASILY ESTIMATE THE IMPACT OF CHANGE WITH 300 PROVEN PHOTONICS CALCULATIONS! UPDATED WITH 100 COMPLETELY NEW AND IMPROVED RULES AND ORGANIZED INTO 18 CHAPTERS THAT INCLUDE LASERS, DETECTORS, OPTICS OF THE ATMOSPHERE, AND MANY MORE! Here is a handy compilation of 300 cost-saving, think-on-your-feet photonics rules of thumb designed to save you hours of design time and a world of frustration. Within seconds you can accurately gauge the impact of a suggested design change on your project. It is the premiere collection of these valuable rules in a single, quick look-up reference. These simple-to-

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implement calculations allow you to rapidly pinpoint trouble spots, ask the right questions at meetings, and are perfect for quick sanity checks of last-minute specifications or performance feature additions. Offering a convenient alphabetical arrangement according to specialty, this unique reference spans the entire spectrum of photonics, including: \* Eighteen chapters covering optics, electro-optics, optics of the atmosphere, radiometry, technologies related to security and surveillance systems, lasers, and many others. \* If you want to develop a sense of what will work and what won't and want the calculations to keep things real, Photonics Rules of Thumb belongs on your desk or in your pocket.

The aim of this book is to present the modern design principles and analysis of lens antennas. It gives graduates and RF/Microwave professionals the design insights in order to make full use of lens antennas. Why do we want to write a book in lens antennas? Because this topic has not been thoroughly publicized, its importance is underestimated. As antennas play a key role in communication systems, recent development in wireless communications would indeed benefit from the characteristics of lens antennas: low profile, and low cost etc. The major advantages of lens antennas are narrow beamwidth, high gain, low sidelobes and low noise temperature. Their structures can be more compact and weigh less than horn antennas and parabolic antennas. Lens antennas with their quasi-optical characteristics, also have low loss, particularly at near millimeter and submillimeter wavelengths where they

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have particular advantages. This book systematically conducts advanced and up-to-date treatment of lens antennas.

How to manage the most important part of a city's internal infrastructure--its sewer systems The operation and maintenance of modern sewer systems have not kept pace with technological revolutions everywhere--until now. Utilizing a combination of computerized management tools, monitoring systems, and other intelligent equipment, today's automated sewer management systems allow designers, managers, operators, and investors to get continuous data feeds on sewerflows, interjurisdictional billing information, and emergency situations: information essential to upgrading overall system quality and efficiency. Sewer Management Systems offers a practical, comprehensive look at procuring and implementing state-of-the-art sewer management systems and monitoring equipment. It opens with an overview of sewer maintenance and management and then discusses such introductory concepts as understanding flow and how to measure it. It then introduces structures and features of the sewer infrastructure that are useful in general ways, providing definitions applicable in any context. Further chapters cover:

- \* Step-by-step guidance on making system purchase decisions
- \* Data communications, utility services, and sequencing
- \* How to clearly apply data generated to tangible, real-world tasks
- \* Additional functions that may be designed after the system is up and running
- \* Algorithm development for warnings and

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features for automatic sewer control \* How to get a return on investment for an upgraded system--showing how to use it as a funding source, not just a funding pit \* How to upgrade the installed monitoring system The book's appendices provide equipment specifications, recommended calibration standards, and sample specifications. Offering methodical and detailed guidance to the state of the art of this important engineering specialty, Sewer Management Systems is the complete reference to designing systems that effectively monitor that most basic part of a city's infrastructure--the key to maintain

Anyone can master the fundamentals of game design - no technological expertise is necessary. The Art of Game Design: A Book of Lenses shows that the same basic principles of psychology that work for board games, card games and athletic games also are the keys to making top-quality videogames. Good game design happens when you view your game from many different perspectives, or lenses. While touring through the unusual territory that is game design, this book gives the reader one hundred of these lenses - one hundred sets of insightful questions to ask yourself that will help make your game better. These lenses are gathered from fields as diverse as psychology, architecture, music, visual design, film, software engineering, theme park design, mathematics, writing, puzzle design, and anthropology. Anyone who reads this book will be inspired to become a better game designer - and will understand how to do it.

This title is directed primarily towards health care professionals outside of the United States. The 3rd edition of Contact Lens Optics & Lens Design provides a straightforward introduction and offers solutions to the vast

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majority of contact lens optics problems likely to be encountered in practice. This edition has been thoroughly updated and contains integral coverage of soft lenses, information on the latest corneal measuring techniques, and expanded coverage of astigmatism and corneal toricity. It includes a new chapter on presbyopia and separate treatment of orthokeratology. Also included on the CD-ROM, is a set of invaluable computer programs, which allow the users to bypass tedious calculations in arriving at best fits. Offers solutions to the vast majority of contact lens optics problems Includes a companion CD-ROM with calculators to resolve fitting problems Revised, expanded, and updated computer programs on CD-ROM New two-color design throughout Color plate section Integral coverage of soft and RGP lenses In-depth information on mean thickness and harmonic mean thickness Discussion of the latest corneal measuring techniques Wavefront aberrations Soft toric lenses discussed in detail New chapter on presbyopia correction and soft lens bifocal design Coverage of orthokeratology and other cutting-edge techniques

This work covers spatial frequency, spread function, wave aberration, and transfer function - and how these concepts are related in an optical system, how they are measured and calculated, and how they may be useful.

This Field Guide derives from the treatment of geometrical optics that has evolved from both the undergraduate and graduate programs at the Optical Sciences Center at the University of Arizona. The development is both rigorous and complete, and it features a consistent notation and sign convention. This volume covers Gaussian imagery, paraxial optics, first-order optical system design, system examples, illumination, chromatic effects, and an introduction to aberrations. The appendices provide supplemental material on radiometry and photometry, the human eye, and several

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other topics.

The Art and Science of Optical Design is a comprehensive introduction to lens design, covering the fundamental physical principles and key engineering issues. Several practical examples of modern computer-aided lens design are worked out in detail from start to finish. The basic theory and results of optics are presented early on in the book, along with a discussion of optical materials. Aberrations, and their correction, and image analysis are then covered in great detail. Subsequent chapters deal with design optimisation and tolerance analysis. Several design examples are then given, beginning with basic lens design forms, and progressing to advanced systems, such as gradient index and diffractive optical components. In covering all aspects of optical design, including the use of modern lens design software, this book will be invaluable to students of optical engineering as well as to anyone engaged in optical design at any stage.

This tutorial explains the human eye, its function, and performance limits from the perspective of an experienced optical engineer and lens designer. It is concise and readable, with examples and data, and is intended for students, practicing engineers, and technology users.

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