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Handbook of Optical Holography is composed of 10 chapters that readers can turn to for specific questions regarding holography. This book begins by elucidating the classification of holograms, major types of holograms, and variations. The text then explains the image formation, cardinal points and principal rays for holography, equipment, and procedures.

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The book presents the principles and methods of holographic interferometry - a coherent-optical measurement technique for deformation and stress analysis, for the determination of refractive-index distributions, or applied to non-destructive testing.

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Holographic interferometry (HI) is a technique which enables static and dynamic displacements of objects with optically rough surfaces to be measured to optical interferometric precision. These measurements can be applied to stress, strain and vibration analysis, as well as to non-destructive testing and radiation dosimetry. It can also be used to detect optical path length variations in transparent media, which enables, for example, fluid flow to be visualised and analyzed. It can also be used

The book presents the principles and methods of holographic interferometry - a coherent-optical measurement technique for deformation and stress analysis, for the determination of refractive-index distributions, or applied to non-destructive testing. Emphasis of the book is on the quantitative computer-aided evaluation of the holographic interferograms. Based upon wave-optics the evaluation methods, their implementation in computer-algorithms, and their applications in engineering are described.

This book is an introduction to holographic interferometry - a field of holography having a great number of important and practically useful ap pl ications. It is intended for special ists working in the field of optics and holography, and also for students of the relevant specialities. At present, a gr eater and greater number of mechanica l engi neers, tur bine designers, testers of diverse equipment, biologists, crystallographers, and so on have to do with holographic interferometry. To allow these spe cialists, who are comparatively far from optics, to master the subject too, the main content of the book is preceded by an introductory chapter treating the fundamental concepts of the interference of light, optical interferometry, holography and holographic interferometry. The following chapters deal with the fundamentals of the theory of ho lographic interferometry and of experimental equipment. The authors have set themselves the task of sharing their more than ten year of experience of work in the field of holographic interferometry with their readers. In this connection, the questions which they dealt with directly are con sidered in somewhat greater detail, as a rule, than those with which they have become acquainted only from publications on the subject. A sufficiently detailed (although far from complete) bibliography gives any interested reader an opportunity to improve his knowledge of this field.

As a reference book, the Springer Handbook provides a comprehensive exposition of the techniques and tools of experimental mechanics. An informative introduction to each topic is provided, which advises the reader on suitable techniques for practical applications. New topics include biological materials, MEMS and NEMS, nanoindentation, digital photomechanics, photoacoustic characterization, and atomic force microscopy in experimental solid mechanics. Written and compiled by internationally renowned experts in the field, this book is a timely, updated reference for both practitioners and researchers in science and engineering.

Handbook of Optical Holography is composed of 10 chapters that readers can turn to for specific questions regarding holography. This book begins by elucidating the classification of holograms, major types of holograms, and variations. The text then explains the image formation, cardinal points and principal rays for holography, equipment, and procedures. This book also tackles special problems and application areas of this technology. This text will be valuable to people who want to apply holography—whether to industry, government, health services, education, or research.

Handbook of Optical Metrology: Principles and Applications begins by discussing key principles and techniques before exploring practical applications of optical metrology. Designed to provide beginners with an introduction to optical metrology without sacrificing academic rigor, this comprehensive text: Covers fundamentals of light sources, lenses, prisms, and mirrors, as well as optoelectronic sensors, optical devices, and optomechanical elements Addresses interferometry, holography, and speckle methods and applications Explains Moiré metrology and the optical heterodyne measurement method Delves into the specifics of diffraction, scattering, polarization, and near-field optics Considers applications for measuring length and size, displacement, straightness and parallelism, flatness, and three-dimensional shapes This new Second Edition is fully revised to reflect the latest developments. It also includes four new chapters—nearly 100 pages—on optical coherence tomography for industrial applications, interference microscopy for surface structure analysis, noncontact dimensional and profile metrology by video measurement, and optical metrology in manufacturing technology.

Transparent in the visible range, phase objects can be studied in the optical range using holographic interferometry. Typically, the holograms are recorded on high-resolving-power holographic photo materials, but a lower spatial resolution is sufficient for successful research in many scientific applications. Holographic Interferometry: A Mach–Zehnder Approach offers practical guidance to research scientists and engineers using Mach–Zehnder holographic interferometry methods to study phase objects in the laboratory. The Mach–Zehnder approach allows the use of standard photographic film and electronic CCD/CMOS sensors with low resolving power, making it a simpler and more affordable option for testing many types of phase objects. This book demonstrates how to use standard photographic film for the optical recording and reconstruction of Mach–Zehnder holograms. It also illustrates techniques for using CCD/CMOS cameras to digitally record Mach–Zehnder holograms/interferograms of transparent objects. Bringing together original research and information scattered throughout existing literature, this book focuses on the holographic reference beam and shearing interferometry methods. In particular, it looks at how these methods and optical schemes can be directly applied to testing aerodynamic flows, as well as to plasmas, shocks, and waves in noncoherent laser–matter interactions. Numerous reconstructed and classic interferograms, deflectograms, and Schlierengrams illustrate the material, helping readers develop and design their own optimal optical scheme and choose applicable details to apply the approach. Describing methods in a mathematically simple and accessible way, this book is also suitable for graduate students in the fields of aerospace engineering and optics, as well as those in laser, thermal, and plasma physics.

Optical Holography: Materials, Theory and Applications provides researchers the fundamentals of holography through diffraction optics and an overview of the most relevant materials and applications, ranging from computer holograms to holographic data storage. Dr. Pierre Blanche leads a team of thought leaders in academia and industry in this practical reference for researchers and engineers in the field of holography. This book presents all the information readers need in order to understand how holographic techniques can be applied to a variety of applications, the benefits of those techniques, and the materials that enable these technologies. Researchers and engineers will gain comprehensive knowledge on how to select the best holographic techniques for their needs. Covers current applications of holographic techniques in areas such as 3D television, solar concentration, non-destructive testing and data storage Describes holographic recording materials and their most relevant applications Provides the fundamentals of holography and diffraction optics

This reference tutorial contains modern experimental approaches to analysis of strain-stress distribution based on interference-optical methods of registration of strain or displacement fields, including coherent-optical techniques (holographic interferometry, speckle photography, electronic digital speckle interferometry techniques) and photoelastic methods as well as the shadow optical method of caustic. The book describes the theory, efficient scope of application in the every-day practice and the problems of further development of these techniques. Much attention is paid to new and promising advanced developments in the field of observation and computational methods for study of residual stress, determination of fracture mechanics parameters and material deformation characteristics. The content corresponds to the course of lectures delivered by the author at the N.E. Bauman Moscow State Technical University. It is intended for technical university students, research engineers and postgraduate students who are doing analysis of strain-stress state and strength of structural elements.

Optical Methods of Measurement: Wholefield Techniques, Second Edition provides a comprehensive collection of wholefield optical measurement techniques for engineering applications. Along with the reorganization of contents, this edition includes a new chapter on optical interference, new material on nondiffracting and singular beams and their applications, and updated bibliography and additional reading sections. The book explores the propagation of laser beams, metrological applications of phase-singular beams, various detectors such as CCD and CMOS devices, and recording materials. It also covers interference, diffraction, and digital fringe pattern measurement techniques, with special emphasis on phase measurement interferometry and algorithms. The remainder of the book focuses on theory, experimental arrangements, and applications of wholefield techniques. The author discusses digital hologram interferometry, digital speckle photography, digital speckle pattern interferometry, Talbot interferometry, and holophotoelasticity. This updated book compiles the major wholefield methods of measurement in one volume. It provides a solid understanding of the techniques by describing the physics behind them. In addition, the examples given illustrate how the techniques solve measurement problems.

Phase Estimation in Optical Interferometry covers the essentials of phase-stepping algorithms used in interferometry and pseudointerferometric techniques. It presents the basic concepts and mathematics needed for understanding the phase estimation methods in use today. The first four chapters focus on phase retrieval from image transforms using a single frame. The next several chapters examine the local environment of a fringe pattern, give a broad picture of the phase estimation approach based on local polynomial phase modeling, cover temporal high-resolution phase evaluation methods, and present methods of phase unwrapping. The final chapter discusses experimental imperfections that are liable to adversely influence the accuracy of phase measurements. Responding to the push for the deployment of novel technologies and fast-evolving techniques, this book provides a framework for understanding various modern phase estimation methods. It also helps readers get a comparative view of the performance and limitations of the approaches.