

EXPERIMENTAL STRESS ANALYSIS

Dr. Sadhu Singh

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EXPERIMENTAL STRESS ANALYSIS

(A textbook for engineering students)

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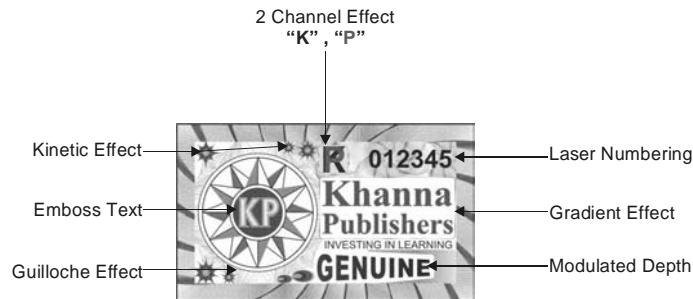
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Forward

I am very happy to know that Dr. Sadhu Singh, Professor of Mechanical Engineering of this University, has written a Textbook on Experimental Stress Analysis. This is a relatively new subject not only for Indian Universities but also for many universities all over the world. This book, as far I know, is the first one of its kind, written on this subject by an Indian author.

The coverage of various aspects of this subject, varying from theory to practice, is quite comprehensive. The book, apart from providing up-to-date information on various topics relevant to Stress Analysis, also contains a selected bibliography at the end of each chapter. Undoubtedly, this book will be of immense use to Undergraduate and Postgraduate students of Engineering and hopefully, it will also help the research workers in pursuing their work with the consciousness of advanced work already done in the field.

I congratulate Dr. Singh for writing a book on this new and developing subject and hope that the engineering students, research workers and teachers will find it very useful.

Anand Sarup,

Vice Chancellor

G.B. Pant University of Agriculture & Technology

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U.P. INDIA

Preface

A course on '*Experimental Stress Analysis*' is now being offered to students in Mechanical, Production, Civil and Aeronautical Engineering both at the undergraduate and the postgraduate levels. The need for a book covering the various aspects of Experimental Stress Analysis has been felt since long.

This book has been written to serve as a textbook on Experimental Stress Analysis. An essential feature of the book in hand is its completeness in respects. A reasonably deep coverage is presented on each topic incorporating the latest information available. A number of problems have been solved in each chapter with a purpose to illustrate the fundamental principles of various methods of stress analysis. At the end of each chapter, quiz questions, numerous exercises and references have been added for practice and further reading.

The book consists of eighteen chapters. The first chapter outlines the basic principles of elasticity. In chapters two to five, strain gauges of different types, strain rosettes, circuits for measuring static and dynamic strains, instrumentation and transducer applications of strain gauges have been discussed. Semiconductor strain gauges have been discussed in chapter six. Chapters seven and eight deal with the two and three dimensional photoelastic methods. In chapters nine and ten photoelastic coatings and brittle lacquer coatings have been discussed in detail. The scattered light method of photoelasticity has been dealt with in brief in chapter seven. Chapter twelve deals with the grid method of strain analysis and the moire methods of strain analysis have been discussed in chapter thirteen. Model laws have been dealt with in chapter fourteen and the analogous methods in chapter fifteen.

Chapter 16 is on Numerical Method followed by Photo-Holo-Elasticity and Photo-Orthotropic Elasticity.

A special advantage of the book is its presentation, which is simple and thorough. The material embodied has been carefully chosen from various research journals and books and assimilated by the author over the past many years. It is hoped that the book will be appreciated for the immense value it has for the readers.

I wish to record my sincere thanks to the Society for Experimental Stress Analysis (SESA), USA ; Joint British Society for Stress Analysis (JBSSA), Uk ; British Society for Strain Measurements (ASME), USA and the Japanese Society of Mechanical Engineers (JSME), Japan ; whose valuable literature in their journals

was consulted during the preparation of this book. Thanks are also due to M/s Photoelastic Inc. ; Vishay Intertechnology, Inc. ; BLH Electronics ; Magnaflux Corporation ; Ailtech and Micro-Measurements of USA ; Tinsely Telcon Ltd., UK ; CIBAGIEGY of India Ltd. ; Electronics Corporation of India Limited, Hyderabad & Motwane Private Ltd., Bombay. They were very kind in sending their literature on the various instruments manufactured by them.

I am very grateful to Sh. Anand Sarup, Vice Chancellor, G.B. Pant Krishi Evam Praudyogik Vishwavidyalaya, Pantnagar, for writing a beautiful foreward to the book. I am also thankful to my many friends and colleagues from whom I received constant encouragement and suggestions during the writing of this book.

Obviously, I shall be failing in my duty if I did not thank and express my gratitude to my wife Mrs. Manjit and the Children, Kamal, Gudia & Rinku, without whose patience and cooperation this work would not have been possible.

Suggestions for the improvement of the book shall be highly appreciated and acknowledged.

—Dr. Sadhu Singh

*Dedicated to the loving sweet memory of my mother
who could not see what I am today*

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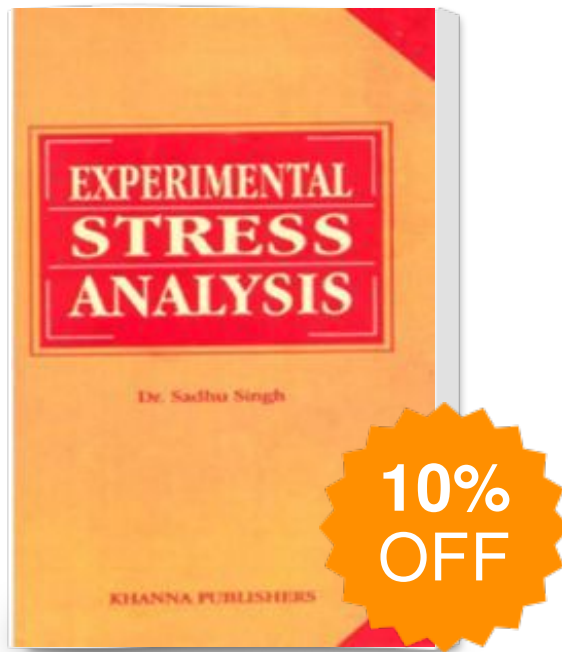
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