



The Mathematics of Thermal Modeling: An Introduction to the Theory of Laser Material Processing

By John Michael Dowden

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The use of lasers for various applications in materials processing has grown rapidly in recent years. Lasers are by nature particularly well suited to automation, but to ensure repeatability and reliability, the engineers employing them must not simply rely on numerical analysis software. They must have a firm grasp on the physical principles involved.

Mathematics of Thermal Modelling: An Introduction to the Theory of Laser Material Processing introduces the mathematics needed to formulate and exploit the physical principles important to modelling various aspects of laser material processing. The author shows how to gain insight by constructing and analyzing simple models. He demonstrates how to extract qualitative information from the models, how the underlying principles can be extended to more complex modelling, and how these principles can be applied to processes such as laser welding, surface treatment, drilling, and cutting.

Written at a level accessible to graduate students, this book shows that simple mathematical investigation-- based primarily on analytical methods backed by relatively simple numerical methods--can greatly illuminate the processes being studied. Regardless of the stage of your career development, if you are confronting the modelling of thermal process in this field for the first time, Mathematics of Thermal Modelling will build the foundation you need.

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Review

The book is written very transparently, it uses adequate mathematical sophistication and physical background. ... [R]ecommended to engineers and material scientists at the Ms. or Ph.D. level, or to mathematicians interested in technological problems.

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