

# Preface

The present book is the outcome of some decades of research and teaching in plasticity and fracture mechanics at various places and institutions. Both subjects have been graduate courses for engineering students over four semesters of four hours per week at the Technical University of Berlin in the 1980s and 1990s. The correspondent lecture notes, jointly written with my former colleagues Knut Burth and Jürgen Olschowski, who both passed away much too early, comprised 200–250 pages per semester. With the European Bologna reform of university education starting in 2000, the curriculum had to be reduced to one course “Plasticity and Fracture”, and since a second course on “Elasticity and Fracture” was no compulsory precognition, a short survey on linear elastic fracture mechanics appeared necessary before plasticity could start. This forced the author to compress the substance of teaching by 75% and restrict it to what he considered to be the absolute minimum of knowledge which a student has to learn in order to be able to educate himself in later years, when working in industry or science. The purpose could not be giving a comprehensive presentation of plasticity and fracture mechanics, any more, but providing a general and science-based impression of basic concepts which should be useful for both industrial practice and science.

This has become the design principle of the present book which relies on respective lecture notes, again. Combining both, plasticity and fracture, in one course and in one book means curtailing any encyclopaedic pretence but opens the chance for an interdisciplinary view on both subjects with regular cross references in the context of a unified nomenclature. This relieves the reader from switching between different books and different terminologies. Links to corresponding standards help clarifying the scientific foundation of engineering applications and rating their potentials and limits.

Beyond that, the book wants to make students familiar with relevant original literature in a time when the number of journals and publications expands exponentially and is overgrowing seminal and fundamental papers of the past. Research politics enforces publishing, and hence writing own papers has gained priority to studying other people’s publications. The consequences for research and science are obvious. The total number of papers increases but the number of really significant

publications does not, making it difficult to separate the wheat from the chaff, particularly for students, young engineers and scientists.

Not least, the motivation for compiling this book results from experiences with reading and reviewing manuscripts submitted to scientific journals, in which similar misconceptions of established concepts reappear regularly and identical problems are solved again and again by young scientists who are not thoroughly advised by senior scientists. It is alarming which weird opinions about the  $J$ -integral and its path dependence in incremental plasticity can still be found in the literature and in computer manuals 50 years after its introduction into fracture mechanics. Manuscripts on correction terms of  $J$  for multiphase materials are submitted periodically. If the present book could help bringing some light into obscurity, the author would be delighted.

On the background of its history, the present book could not have been written without the valuable help, cooperation and assistance of many colleagues along my professional career, starting with Georgia Künecke and Dieter Noack at BAM Berlin, Knut Burth and Jürgen Olschewski jointly lecturing plasticity and fracture mechanics at the TU in Berlin, and ending with Ingo Scheider, Dirk Steglich and Manfred Schödel at GKSS (now Helmholtz Centre) Geesthacht, just to mention the most outstanding. I acknowledge their contributions whose merit and value are greater than references of their publications in the bibliography can express.

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