PREFACE

This book has been developed from subject matter and examples that I have used in my teaching of solid mechanics, structures and strength of materials in Universities over the last two decades. It is intended for engineering degree and diploma courses in which solid mechanics and structures form a part. Postgraduates and those preparing for the membership of professional institutions by examination in these subjects will also find this book useful. The contents illustrate where overlapping topics in civil, aeronautical and materials engineering employ common principles and thereby should serve engineering students of all disciplines. In the author's experience this broadening of the subject base is also aligned to the teaching of applied mechanics within enginering science degree courses.

A concise approach has been employed for the theoretical developments in order to provide the space for many illustrative examples. It should become obvious that these calculations are all related to the load carrying capacity of materials used in engineering design. Amongst the requirements are the choice of material, its physical shape, the assessment of the nature of imposed loading and its effect on life expectancy. The text illustrates where and how the necessary techniques are to be employed in each case. The reader will soon recognise, for example, that under elastic loading, the solution to the stress and strain suffered by a material invariably becomes that of satisfying three requirements: equilibrium, compatibility and the boundary conditions. The style adopted has been to provide mostly self-contained chapters with a logical and clear presentation of the subject matter. Earlier material underpins the analyses given in later chapters. This allows occasional reference to other chapters without detracting from the main argument. The choice of general chapter titles, that contain many specific topics, emphasise the more wide ranging principles of the subject.

The first three chapters of the text are arranged to cover the necessary fundamental material on stress and strain analyses and plane elasticity theory. A structures theme follows with the full treatment of theories of bending and torsion. This theme continues with coverage of the moment distribution method, shear flow and strut buckling. The chapter on energy methods and virtual work precedes chapters on finite elements, yield and strength criteria. Thereafter, the mechanics of inelastic solids appears with chapter on plasticity and collapse, creep and visco-elasticity. The final two chapters on high and low cycle fatigue and fracture mechanics reflect some of the more recent developments in solid mechanics.

Each topic, as it appears, is illustrated by worked examples throughout. Many exercises on these topics appear at the end of each chapter. The interested reader and user of the book may, at a later date, wish to consult a solution manual to the exercise sections, which is now in preparation.

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