# Contents

Preface ......................................................... ix

Chapter 1: Fundamentals of Fracture Mechanics .......... 1
   - Energy Considerations ................................ 1
   - Stress Analysis of Cracks .............................. 6
   - Relationship Between $K$ and $K$ ...................... 12
   - The Role of Crack Tip Plasticity ...................... 15
   - Other Fracture Indices .................................. 21

Chapter 2: Fracture Phenomena .............................. 31
   - Modes of Failure: Plane Stress versus Plane Strain .. 31
   - Fracture Toughness Data Representation ............. 35

Chapter 3: Fatigue Crack Propagation ....................... 65
   - Constant-Amplitude Loading ........................... 65
   - Variable-Amplitude Loading ............................ 89
   - Other Factors Affecting Cyclic Crack Growth .......... 103

Chapter 4: Life Assessment and Improvement Methods ..... 109
   - Damage Tolerance Analysis Methodology ............ 110
   - Methods for Determining Stress Intensity Factors .... 113
   - Stress Intensity Reduction Techniques ................ 139
   - Pressurized Cylinders and Vessels .................... 174
   - Elastic-Plastic Fracture ................................ 179

Chapter 5: Crack Opening Mode Stress Intensity Factor Solutions ......................... 195
   - LEFM Geometry Factors ............................... 195
   - Through-the-Thickness Crack in a Plate ............... 201
   - Part-Through Crack in a Plate ......................... 229
   - Corner Crack(s) at a Circular Hole .................... 249
   - Crack at Pin Hole in a Lug ............................. 253
   - Crack in a Solid Cylinder .............................. 256
   - Crack on the Circumferential Plane of a Hollow Cylinder .... 258
   - Pressurized Cylinder and Sphere ...................... 260