

Contents

Series on engineering application of fracture mechanics	VII
Foreword	IX
Editors' preface	XI
Contributing authors	XIII
Group photograph	XIV
Chapter 1. Fatigue life prediction: metals and composites	1
R. Badaliance	
1.1. Introduction	1
1.2. Random spectrum load generation	2
1.3. Constant amplitude fatigue	3
1.4. Spectrum fatigue	9
References	12
Chapter 2. Fracture mechanics of engineering structural components	35
G.C. Sih	
2.1. Introduction	35
2.2. Strength and fracture properties of materials	36
2.3. Simple fracture experiments	44
2.4. Design of machine and structural components	50
2.5. Ductile fracture	61
2.6. Fatigue crack propagation	70
2.7. Appendix I. Strain energy density factor in linear elasticity	86
2.8. Appendix II. Critical ligament length	87
2.9. Appendix III. Fracture toughness test	88
2.10. Appendix IV. A brief account of ductile fracture criteria	94
References	99

Contents

Chapter 3. Failure mechanics: damage evaluation of structural components	103
O. Orringer	
3.1. Introduction	103
3.2. Failure of a railroad passenger car wheel	104
3.3. Describing the load environment	106
3.4. Interpreting service load data	117
3.5. Predicting safe life	131
3.6. Maintaining perspective	143
3.7. Concluding remarks	144
References	148
Chapter 4. Critical analysis of flaw acceptance methods	151
C.M. Branco	
4.1. Introduction	151
4.2. Defects: distribution and non-destructive testing capability	151
4.3. Damage tolerance assessment	155
4.4. Flaw acceptance criteria	158
4.5. Conclusions	167
References	167
Chapter 5. Reliability in probabilistic design	169
L. Faria	
5.1. Introduction	169
5.2. Structural integrity	170
5.3. Designing for structural integrity	172
5.4. Safety factor and reliability	172
References	174
Subject index	175