

Contents

Introduction	1
Chapter 1 Preliminaries	5
1.1 Vector and Tensor Analysis	5
1.2 Paths and Line Integrals	7
1.3 Kinematics and the Balance Laws	11
1.4 Simple Materials with Memory	15
Chapter 2 A Theory of Thermodynamics	21
2.1 Processes	21
2.2 The Thermodynamic Inequality	23
2.3 Heat Conduction Inequalities	24
2.4 The Conversion of Heat into Mechanical Work	27
Chapter 3 The Construction of the Entropy	31
3.1 The Clausius Inequality	31
3.2 Fading Memory	34
3.3 The Entropy in Equilibrium. Thermostatics	38
3.4 The Entropy away from Equilibrium. The Clausius-Planck Inequality	45
Chapter 4 Applications	55
4.1 Thermoelasticity and Materials of Differential Type	55
4.2 A Class of Viscoelastic Materials	60
Chapter 5 Thermodynamics based on the Clausius-Duhem Inequality	77
5.1 The Clausius-Duhem Inequality	78
5.2 Materials of the Differential Type	81

5.3	Materials with Fading Memory and Instantaneous Elastic Response	85
5.4	Behaviour near Equilibrium	95
5.5	The Internal Energy as an Independent Variable . . .	103
Chapter 6	Thermodynamic Restrictions on Isothermal Linear Viscoelasticity	111
6.1	Compatibility with Thermodynamics. Dissipative Relaxation Functions	111
6.2	The Symmetry of the Relaxation Function	123
6.3	A Remark on the Monotonicity of Relaxation Functions	128
	References	129
	Subject Index	133