

Contents

Preface **vii** ■ Acknowledgments **xi** ■ Acronyms and Symbols **xiii**

CHAPTER 1	Anatomy and Physiology of Muscle Bioelectric Signals	1
	Anatomical Features of Muscle	2
	Physiology of the Muscle Fiber	5
	Motor Unit Features	9
	Techniques for Modulating Muscular Force	12
	Other Physiological Influences on the Electromyogram	14
	For Further Reading	15
CHAPTER 2	Bioelectricity	17
	Forces in Electricity	18
	Essentials of Electric Circuits	27
	Essentials of Alternating Current	43
	For Further Reading	53
CHAPTER 3	EMG Instrumentation	55
	Electrodes	56
	Electrode Configuration	65
	Amplifier Characteristics	72
	Grounding	89
	Computer Interfacing	95
	For Further Reading	103
CHAPTER 4	EMG Signal Processing	105
	Amplitude	106
	Cross-Correlation Function	119
	Frequency	126
	Data Window Length	139
	Noise Contamination	141
	Basic Concepts of Digital Filtering	149
	For Further Reading	154
CHAPTER 5	EMG-Force and EMG-Fatigue Relationships	155
	Relationships Between Muscular Force and EMG	156
	EMG Analysis During Fatiguing Contractions	159
	Advanced EMG Issues During Fatiguing Contractions	163
	For Further Reading	167

CHAPTER 6	Other EMG Applications	169
	EMG and Gait	170
	EMG Activation Timing	182
	Evoked Potentials	184
	Ballistic Movements	192
	For Further Reading	196
Appendix 2.1	Calculation of Electric Fields	197
Appendix 2.2	Calculating the Electric Potential at a Point	201
Appendix 2.3	Electric Circuits	207
Appendix 2.4	Charging a Capacitor Through a Resistor	211
Appendix 2.5	The Muscle Fiber as an RC Circuit	215
Appendix 3.1	Muscle–Tendon End Effects	219
Appendix 4.1	EMG Area and Slope Measurement	221
Appendix 4.2	Cross-Correlation Function	223
Appendix 4.3	Calculating Fourier Coefficients	225
	Glossary 229 ■ References 235 ■ Author Index 253 ■	
	Subject Index 259 ■ About the Authors 265	