

TABLE OF CONTENTS

Chapter 1

INTRODUCTION.....	1
I. Some Physical Characteristics of Magnetically Ordered Systems	1
A. Ferromagnet	1
B. Antiferromagnet	2
C. Ferrimagnet	2
D. Noncollinear Spin Systems	3
II. Magnetic Moments in the Bulk and at the Surface.....	4

Chapter 2

THE STRUCTURAL ASPECTS OF SURFACES.....	9
I. Introduction	9
II. Surface Crystallography.....	9
III. Reciprocal Lattice and Low Energy Electron Diffraction (LEED).....	12
IV. Surface Thermodynamics	15
V. Defects of Crystalline Surfaces	18
VI. The Equilibrium Shape of Crystalline Surfaces	20
VII. Surface Melting, Surface Roughening, and Wetting	21
A. Roughening Transition	22
B. Surface Melting	23
C. Wetting.....	24

Chapter 3

MAGNETIC SURFACES	27
I. Introduction	27
II. The Ising Model and its Applications	27
A. The Lattice-Gas Model of Adsorption	30
B. The Wetting Transition	32
C. Surface Segregation	34
III. Statistical Thermodynamics	36
IV. Spin Polarized Low Energy Electron Diffraction (SPLEED)	39
V. Magnetic LEED and Surface Mössbauer Effect	42
A. Magnetic LEED and other Scattering Methods	42
B. Surface Mössbauer Effect	45
VI. Magnetic Surface Anisotropies.....	50
A. Anisotropy in the Bulk	50
B. Anisotropy at the Surface	56
VII. Surface-Induced Magnetic Structure	57
A. Surface-Induced Domain Wall.....	57
B. Irreversible Rotation of Surface Magnetization	59

Chapter 4

EFFECTIVE FIELD THEORIES.....	63
I. Introduction	63
II. The Weiss Molecular Field	63
III. The Ising Ferromagnet with a Free Surface — Mean Field Approximation	65
A. Phase Diagram	67
B. Surface Magnetization Curve	69

IV.	A Continuous Approximation of the Prototype.....	71
V.]	A Surface with an Amorphous Layer	74
VI.	Surface Magnetization: Experimental Results	80
VII.	An Improvement of the Mean Field Theory	83
VIII.	Prototype of Surface Magnetism: Effective Field Theory	87
	A. Phase Diagram	88
	B. Surface Magnetization Curve	89

Chapter 5

	CRITICAL PHENOMENA	93
I.	Introduction	93
II.	General Properties	93
III.	Bulk Critical Phenomena in Mean Field Approximation	97
IV.	Mean Field Theory of Surface Critical Phenomena	102
	A. Ordinary Transition ($A \triangleleft A_c$)	104
	B. Definitions of Critical Exponents and their Mean Field Results	106
	C. Surface Effects at a Bulk Tricritical Point and at a Bulk First- Order Transition	108
V.	Scaling Concept and Scaling Relations	109
VI.	Experimental Results and Monte Carlo Simulations	114

Chapter 6

	ADVANCED STUDIES	119
I.	Introduction	119
II.	Fluid-Magnet Analogy	119
III.	Wetting Transitions in a Semi-Infinite Ising Ferromagnet	122
IV.	Effects of Single-Ion Anisotropy	126
V.	Ferrimagnetism	130
VI.	A Semi-Infinite Ferrimagnetic Mixed Ising Alloy with Single-Ion Anisotropies	135
	A. Ferromagnetic Mixed System with a Free Surface	138
	B. Ferrimagnet with a Free Surface and a Ferromagnetic Surface Exchange Interaction	140
	C. Ferrimagnet with a Random Surface Single-Ion Anisotropy	142

Chapter 7

	ELEMENTARY EXCITATIONS	145
I.	Introduction	145
II.	Spin Waves in the Bulk	145
III.	The Effect of Surface on Spin Excitation	151
IV.	Semiclassical Description of Spin Waves	155
	A. Bulk Spin Waves	155
	B. Surface Spin Waves	157
V.	Surface Spin Waves of the Prototype	158
VI.	Temperature Dependence of Surface Magnetization	161
VII.	Dipolar Surface Spin Waves	166

	References	169
--	------------------	-----

	Index	175
--	-------------	-----