



# *Contents of Volume 1*

	Preface . . . . .	vii
CHAPTER 1	Introduction . . . . .	1
	1.1 Emission processes in radio astronomy . . . . .	2
	1.2 Introduction to plasma physics . . . . .	8
	1.3 Some simple wave modes . . . . .	12
	1.4 Physical, astrophysical and plasma constants . . . . .	18
	Problem set 1 . . . . .	23
CHAPTER 2	Waves in Plasmas . . . . .	24
	2.1 Mathematical preliminaries . . . . .	24
	2.2 The wave equation . . . . .	32
	2.3 Formal theory of weakly damped waves . . . . .	41
	2.4 Specific wave modes . . . . .	50
	Problem set 2 . . . . .	58
CHAPTER 3	Spontaneous Emission . . . . .	62
	3.1 Solutions of the inhomogeneous wave equation . . . . .	62
	3.2 Emission by particles: Cerenkov emission . . . . .	69
	3.3 Bremsstrahlung . . . . .	78
	3.4 Thomson scattering . . . . .	87
	Problem set 3 . . . . .	95

CHAPTER 4	Gyromagnetic, Synchrotron and Inverse Compton Emissions . . . . .	98
4.1	Gyromagnetic emission . . . . .	98
4.2	Synchrotron emissivity . . . . .	112
4.3	Properties of synchrotron emission . . . . .	120
4.4	Inverse Compton scattering . . . . .	131
	Problem set 4 . . . . .	142
CHAPTER 5	The Induced Processes and Quasi-Linear Theory . . . . .	144
5.1	Semi-classical formalism . . . . .	144
5.2	The induced process . . . . .	152
5.3	The quasi-linear equations . . . . .	157
5.4	Kinetic equations for nonlinear processes . . . . .	170
	Problem set 5 . . . . .	176
CHAPTER 6	The Absorption and Transfer of Radiation . . . . .	179
6.1	Damping and transfer processes in thermal plasmas . . . . .	179
6.2	The transfer equation in the weak anisotropy limit . . . . .	193
6.3	Synchrotron absorption . . . . .	212
6.4	Induced Compton scattering . . . . .	222
	Problem set 6 . . . . .	229
APPENDIX A	Bessel Functions . . . . .	232
APPENDIX B	Specific Dielectric Tensors . . . . .	237
	Answers to problems . . . . .	244
	References . . . . .	251
	List of Frequently Used Symbols . . . . .	256
	Index . . . . .	260

