Contents

1	Aim and Scope			
	1.1	Basic Aspects		
	1.2	Limitations		
	1.3	Lasers		
	1.4	Review of Phenomena and Results		
	1.5	Very High Power Lasers		
	1.6	Further Phenomena and Results		
2	Elements of the Microscopic Plasma Theory			
	2.1	Plasma Frequency and Debye Length		
	2.2	Plasmons		
	2.3	Polarization Shift of H-like Lines in Plasmas		
	2.4	Cyclotron Frequency		
	2.5	Collisions		
	2.6	Anomalous Resistivity, Quantum Collisions		
		and Tokamak Experiments		
3	Kinetic Theory			
	3.1	Distribution Functions		
	3.2	Loss of Information		
	3.3	Derivation of Macroscopic Equations		
	3.4	Landau Damping		
	3.5	Concluding Remarks on Microscopic Theory		
4	Hydrodynamics		69	
	4.1	Euler's Equation of Motion		
	4.2	Bernoulli's Stationary Solution		
	4.3	Equation of Continuity		
	4.4	Compressibility		
	4.5	Acoustic Waves		
	4.6	Equation of Energy		
5	Self-Similarity Model			
	5.1	Hydrodynamic Derivation		
	5.2	Laser Irradiation with Varying Pellet Radius		
	5.3	Numerical Example		
	5.4	Applications to Foils		
	5.5	Introductory Remarks to the Following Three Chapters		

6	Plasm 6.1 6.2 6.3 6.4 6.5 6.6	na Dynamics and Lorentz Theory The Two-Fluid Equation of Motion The Diffusion Equation (Ohm's Law) Electrodynamic Equations Refractive Index of Plasma and Its Relation to Absorption Nonlinear and Relativistic Absorption Absorption Constant and QED Theory	93	
7	Wayes in Inhomogeneous Plasma			
•	7.1	WKB Approximation for Perpendicular Incidence		
	7.2	Oblique Incidence and WKB Solution		
	7.3	The Rayleigh Profile		
	7.4	The Airy Profiles		
8	Equa	tion of Motion	132	
	8.1	Equivalence to Maxwellian Stress Tensor		
	8.2	Obliquely Incident Plane Waves		
	8.3	Nonponderomotive Collisional Term of the Nonlinear Force		
	8.4	Additional Third-Order Terms for Perpendicular Incidence		
	8.5	The General Non-Transient Nonlinear Force		
	8.6	The Transient Nonlinear Force		
	8.7	Single Particle Model of Nonlinear Force		
		and High Internal Electric Fields Inside of Plasmas		
	8.8	Genuine Two Fluid Plasma Model		
		with Full Description of Internal Electric Fields		
	8.9	Double Layers and Surface Tension of Plasmas		
9	Mom	entum and Instability by the Nonlinear Forces	177	
	9.1	Range of Predominance of the Nonlinear Force		
	9.2	Momentum Transfer to the Plasma Corona and Compression		
	9.3	Energy Transfer by Integration of the Nonlinear Force		
	9.4	Photon Momentum in Plasma (Abraham–Minkowski Problem)		
	9.5	Parametric Instabilities		
10	Numerical and Experimental Examples – Solitons			
	10.1	Thermokinetic Forces		
	10.2	Static Case with Nonlinear Forces		
	10.3	Approximative Dynamic Cases		
	10.4	Experimental Examples		
	10.5	Acceleration of Thick Blocks		

10.6 Solitons

	10.7	Numerical Results from the Genuine Two Fluid Model			
		and Electric Double Layers			
	10.8	Smoothing of Laser-Plasma Interaction			
11	Striated Motion and Resonance Absorption				
_	11.1	Striated Motion			
	11.2	Resonance Absorption			
	11.3	A New Resonance at Supercritical Density			
12	Lase	Beams in Plasma	286		
	12.1	Nonlinear Force (Ponderomotive) Self-Focusing			
	12.2	Relativistic Self-Focusing			
	12.3	Tenuous Plasmas, Exact Beams, and Free Electron Lasers			
	12.4	Spontaneous Magnetic Fields – Alfvén Waves			
	12.5	Conclusions for Medium Laser Intensities			
	12.6	Conclusions for Very High Laser Intensities			
	12.7	Exact Gaussian Beam, Cluster Injection Laser Amplifier,			
		and Laser Acceleration of Particles in Vacuum			
13	Lase	r Compression of Plasma for Nuclear Fusion	329		
	13.1	Nuclear Fusion Reactions			
	13.2	Adiabatic Volume Compression and Volume Ignition			
	13.3	Solution of Laser Fusion by Spark Ignition			
		and Indirect Drive			
	13.4	Improvement by Volume Ignition and Direct Drive			
	13.5	Estimations of Future Clean Fuel Fusion			
	13.6	Responsible Politics			
		a) Need for Energy and Need for Safe Environment			
		b) Difficulty of Political Decisions			
		c) Decision About Magnetic Confinement Fusion			
		d) What Can Inertial Confinement Fusion (ICF) Offer?			
Ар	pendi	x A: The Effective Mass	383		
Ap	pendi	x B: The Maxwell-Boltzmann Distribution	387		
Appendix C: Derivation of the General Two-Fluid Equations					
Notes Added in Proof					
List of Symbols					
References (Dy Numbers)					
Subject Index					
Subject Index					