

CONTENTS

Chapter 1: NEWTONIAN MECHANICS

Section 1. Newton's Laws.	1
2. Central Fields of Force.	5
3. Systems of Particles	21

Chapter 2: THE LAGRANGIAN EQUATIONS OF MOTION

Section 1. Constraints	25
2. D'Alembert's Principle	29
3. Lagrange's Equations of Motion.	35
4. Cyclic Coordinates	41
5. Non-Holonomic Constraints; Velocity-Dependent Potentials.	45
6. Conservation Laws	47

Chapter 3: SMALL VIBRATIONS

Section 1. The Theory of Small Vibrations	50
2. The Double Pendulum	57
3. Molecular Vibrations	62
4. The Normal Vibrations of a One-Dimensional Crystal	69
5. Oscillations Around an Equilibrium Motion	73

Chapter 4: DYNAMICS OF RIGID BODIES

Section 1. Introduction	75
2. The Euler Equations	81
3. Rotating Frames of Reference; The Coriolis Force	91

Chapter 5: THE CANONICAL EQUATIONS OF MOTION

Section 1. The Hamiltonian Equations of Motion.	95
2. Canonical Transformations	98
3. Poisson and Lagrangian Brackets; Infinitesimal Transformations . .	103
4. Variational Principles; Time and Energy as Canonically Conjugate Variables	114

Chapter 6: HAMILTON-JACOBI THEORY

Section 1. The Hamilton-Jacobi Equation	121
2. Action and Angle Variables	132
3. Adiabatic Invariants	139

Chapter 7: PERTURBATION THEORY

Section 1. The Anharmonic Oscillator	146
2. Canonical Perturbation Theory	153
3. Zeeman and Stark Effect of the Hydrogen Atom	162

Chapter 8: CONTINUOUS SYSTEMS

Section 1. The Lagrangian and Hamiltonian Formalism for Continua.	167
2. Sound Waves; The Maxwell Equations.	175
BIBLIOGRAPHY	181
PROBLEMS.	183
INDEX.	187
GLOSSARY OF SYMBOLS	190