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**Essential Graduate Physics**  
*Lecture Notes and Problems*

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# Part CM: Classical Mechanics

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<https://www.amazon.com/dp/B0D82C8Z7L>

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## Table of Contents

### Chapter 1. Review of Fundamentals (14 pp.)

- 1.0. Terminology: Mechanics and dynamics
- 1.1. Kinematics: Basic notions
- 1.2. Dynamics: Newton laws
- 1.3. Conservation laws
- 1.4. Potential energy and equilibrium
- 1.5. OK, can we go home now?
- 1.6. Self-test problems (14)

### Chapter 2. Lagrangian Analytical Mechanics (14 pp.)

- 2.1. Lagrange equation
- 2.2. Three simple examples
- 2.3. Hamiltonian function and energy
- 2.4. Other conservation laws
- 2.5. Exercise problems (11)

### Chapter 3. A Few Simple Problems (22 pp.)

- 3.1. One-dimensional and 1D-reducible systems
- 3.2. Equilibrium and stability
- 3.3. Hamiltonian 1D systems
- 3.4. Planetary problems
- 3.5. Elastic scattering
- 3.6. Exercise problems (27)

### Chapter 4. Rigid Body Motion (32 pp.)

- 4.1. Translation and rotation
- 4.2. Inertia tensor
- 4.3. Fixed-axis rotation
- 4.4. Free rotation
- 4.5. Torque-induced precession
- 4.6. Non-inertial reference frames
- 4.7. Exercise problems (37)

### Chapter 5. Oscillations (38 pp.)

- 5.1. Free and forced oscillations
- 5.2. Weakly nonlinear oscillations
- 5.3. Reduced equations
- 5.4. Self-oscillations and phase locking
- 5.5. Parametric excitation
- 5.6. Fixed point classification
- 5.7. Numerical approaches
- 5.8. Higher-harmonic and subharmonic oscillations
- 5.9. Relaxation oscillations
- 5.10. Exercise problems (22)

**Chapter 6. From Oscillations to Waves (30 pp.)**

- 6.1. Two coupled oscillators
- 6.2.  $N$  coupled oscillators
- 6.3. 1D waves
- 6.4. Acoustic waves
- 6.5. Standing waves
- 6.6. Wave decay and attenuation
- 6.7. Nonlinear and parametric effects
- 6.8. Exercise problems (26)

**Chapter 7. Deformations and Elasticity (38 pp.)**

- 7.1. Strain
- 7.2. Stress
- 7.3. Hooke's law
- 7.4. Equilibrium
- 7.5. Rod bending
- 7.6. Rod torsion
- 7.7. 3D acoustic waves
- 7.8. Elastic waves in thin rods
- 7.9. Exercise problems (23)

**Chapter 8. Fluid Mechanics (30 pp.)**

- 8.1. Hydrostatics
- 8.2. Surface tension effects
- 8.3. Kinematics
- 8.4. Dynamics: Ideal fluids
- 8.5. Dynamics: Viscous fluids
- 8.6. Turbulence
- 8.7. Exercise problems (27)

**Chapter 9. Deterministic Chaos (14 pp.)**

- 9.1. Chaos in maps
- 9.2. Chaos in dynamic systems
- 9.3. Chaos in Hamiltonian systems
- 9.4. Chaos and turbulence
- 9.5. Exercise problems (5)

**Chapter 10. A Bit More of Analytical Mechanics (16 pp.)**

- 10.1. Hamilton equations
- 10.2. Adiabatic invariance
- 10.3. The Hamilton principle
- 10.4. The Hamilton-Jacobi equation
- 10.5. Exercise problems (10)

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*Supplemental file* **Exercise Problems with Model Solutions** (202 problems, 304 pp.)

is available online:

<https://essentialgraduatephysics.org/Files/CM%20exercises.pdf>.

B/W paperback copies of these materials are available on *Amazon.com*:

<https://www.amazon.com/gp/product/B0D7ZC7CVX>.

*Additional file* **Test Problems with Model Solutions** (45 problems, 42 pp.)

is available for course instructors from the author upon request – see *Front Matter*.

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## Introductory Remarks

This course mostly follows the well-established traditions of teaching classical mechanics to physics graduate students. Its most distinguishing feature is substantial attention to the mechanics of physical continua, including the discussions of 1D waves in Chapter 6, deformations and elasticity (including 3D waves) in Chapter 7, and fluid dynamics in Chapter 8. A natural extension of the discussion of turbulence in the last of these chapters becomes possible after a brief introduction to deterministic chaos in Chapter 9.

Another not-quite-standard feature of this course is that the introduction to analytical mechanics, starting with the Lagrangian formalism in Chapter 2, is based on the experiment-based Newton's laws rather than general concepts such as the Hamilton principle, which is discussed only at the end of the course (Sec. 10.3). I feel that this route emphasizes better the experimental roots of physics, and the secondary nature of any general principles – regardless of their aesthetic and heuristic value.