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Essential Graduate Physics

Lecture Notes and Problems

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https://essentialgraduatephysics.org/

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Part CM:
Classical Mechanics

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B/W paperback copies of this volume are also available on *Amazon.com*:
https://www.amazon.com/dp/B0D82C8Z7L

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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.