

Chapter 1

Fundamental Principles of Mechanics

1.1 Introduction

Mechanics is a branch of physics. In general, mechanics allows one to describe and predict the conditions of rest or movement of particles and bodies subjected to the action of forces. Aristotle¹ was among the first scholars to introduce the term mechanics. At first, the development of mechanics was related to that of knowledge about the modeling of the Universe. Plato,² Eudoxus,³ and Aristotle are among the creators of the homocentric system, whereas Apollonius,⁴ Hipparchus,⁵ and Ptolemy⁶ created the epicyclic system. The theory they developed, according to which the motionless Earth is the center of the Universe, is called the geocentric theory. As was mentioned previously, Ptolemy, an Alexandrian scholar, was the originator of this theory. He based his ideas on the works of Hipparchus, one of the greatest astronomers of antiquity who explained the complexity of the motion of planets while retaining the central location of the Earth and introducing the combination of circular motions. The geocentric theory is based on the assumptions that the immovable Earth is located at the center of the Universe and that other celestial bodies shaped like spheres revolve around Earth, moving uniformly in circular orbits.

¹Aristotle (384–322 BC), Greek philosopher (Plato's student).

²Plato (428–348 BC), Greek philosopher and mathematician.

³Eudoxus of Cnidus (408–355 BC), Greek philosopher, astronomer and mathematician.

⁴Apollonius of Perga (260–190 BC), Greek mathematician and astronomer (focused on conics and the movement of the Moon).

⁵Hipparchus of Nicaea (190–120 BC), Greek astronomer, mathematician, and geographer; considered a precursor of astronomy.

⁶Claudius Ptolemaeus (100–168), Greek mathematician, astronomer, and geographer; one of the creators of the geocentric theory.

Principles Of Mechanics

Salma Alrasheed



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Synge, 1985 **The Principles of Mechanics** William Emerson, 1836 *The Principles of Mechanics* Henry Crew, 1908

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PRINCIPLES OF MECHANICS HEINRICH. HERTZ, 2018 **Principles Of Mechanics** John L. Synge, 2011-03-23 In a sense this is a book for the beginner in mechanics but in another sense it is not From the time we make our first movements crude ideas on force mass and motion take shape in our minds This body of ideas might be reduced to some order at high school as crude ideas of geometry are reduced to order but that is not the educational practice in North America There is rather an accumulation of miscellaneous facts bearing on mechanics some mathematical and some experimental until a state is reached where the student is in danger of being repelled by the subject as a chaotic jumble which is neither mathematics nor physics This book is intended primarily for students at this stage The authors ambition is to reveal mechanics as an orderly self contained subject It may not be quite so logically clear as pure mathematics but it stands out as a model of clarity among all the theories of deductive science The art of teaching consists largely in isolating difficulties and overcoming them one by one without losing sight of the main problem while attending to the details In mechanics the main problem is the problem of equilibrium or motion under given forces the details are such things as the vector notation the kinematics of a rigid body or the theory of moments of inertia If we rush straight at the main problem we become entangled in the details and must retrace our steps in order to deal with them If on the other hand we decide to settle all details first we are apt to find them uninteresting because we do not see their connection with the main problem A compromise is necessary and in this book the compromise consists of the division into Plane Mechanics Part I and Mechanics in Space Part II *Principles of Mechanics* Salma Alrasheed, 2020-10-08 This open access textbook takes the reader step by step through the concepts of

mechanics in a clear and detailed manner Mechanics is considered to be the core of physics where a deep understanding of the concepts is essential in understanding all branches of physics Many proofs and examples are included to help the reader grasp the fundamentals fully paving the way to deal with more advanced topics After solving all of the examples the reader will have gained a solid foundation in mechanics and the skills to apply the concepts in a variety of situations The book is useful for undergraduate students majoring in physics and other science and engineering disciplines It can also be used as a reference for more advanced levels This work was published by Saint Philip Street Press pursuant to a Creative Commons license permitting commercial use All rights not granted by the work s license are retained by the author or authors **First**

Principles of Mechanics William Whewell,1832

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