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In the past several decades, combustion has evolved from a scientific discipline that was largely empirical to one that is quantitative and predictive. These advances are characterized by the canonical formulation of the theoretical foundation, the strong interplay between theory, experiment, and computation, and the unified description of the roles of fluid mechanics and chemical kinetics. This graduate-level text incorporates these advances in a comprehensive treatment of the fundamental principles of combustion physics. The presentation emphasizes analytical proficiency and physical insight, with the former achieved through complete, though abbreviated, derivations at different levels of rigor, and the latter through physical interpretations of analytical solutions, experimental observations, and computational simulations. Exercises are mostly derivative in nature in order to further strengthen the student's mastery of the theory. Implications of the fundamental knowledge gained herein on practical phenomena are discussed whenever appropriate. These distinguishing features provide a solid foundation for an academic program in combustion science and engineering.