

Motion Simulation and Mechanism Design

with SOLIDWORKS® Motion 2025



Kuang-Hua Chang Ph.D.

Visit the following websites to learn more about this book:



[amazon.com](https://www.amazon.com)

[Google books](https://books.google.com)

[BARNES & NOBLE](https://www.barnesandnoble.com)

Table of Contents

Preface	i
About the Author	iii
Table of Contents	iv

Lesson 1: Introduction to *SOLIDWORKS Motion*

1.1 Overview of the Lesson.....	1-1
1.2 What is <i>SOLIDWORKS Motion</i> ?.....	1-1
1.3 Mechanism Design and Motion Analysis.....	1-3
1.4 <i>SOLIDWORKS Motion</i> Capabilities.....	1-5
1.5 Open Lesson 1 Model.....	1-16
1.6 Motion Examples	1-17

Lesson 2: Animations and Basic Motion—A Single Piston Engine Example

2.1 Overview of the Lesson.....	2-1
2.2 The Single Piston Engine Example	2-1
2.3 Using <i>SOLIDWORKS Motion</i>	2-2
Exercises	2-9

Lesson 3: A Ball Throwing Example

3.1 Overview of the Lesson.....	3-1
3.2 The Ball Throwing Example	3-1
3.3 Using <i>SOLIDWORKS Motion</i>	3-3
3.4 Result Verifications.....	3-10
Exercises	3-12

Lesson 4: A Simple Pendulum

4.1 Overview of the Lesson.....	4-1
4.2 The Simple Pendulum Example	4-1
4.3 Using <i>SOLIDWORKS Motion</i>	4-2
4.4 Result Verifications.....	4-5
Exercises	4-9

Lesson 5: Friction of a Sliding Object

5.1 Overview of the Lesson.....	5-1
5.2 The Sliding Object.....	5-1
5.3 Using <i>SOLIDWORKS Motion</i> : Contact Friction	5-3

5.4	Result Verifications.....	5-11
5.5	Using <i>SOLIDWORKS Motion</i> : Joint Friction.....	5-12
	Exercises	5-19

Lesson 6: A Spring-Mass System

6.1	Overview of the Lesson.....	6-1
6.2	The Spring-Mass System.....	6-1
6.3	Using <i>SOLIDWORKS Motion</i>	6-2
6.4	Result Verifications.....	6-8
	Exercises	6-13

Lesson 7: A Slider-Crank Mechanism

7.1	Overview of the Lesson.....	7-1
7.2	The Slider-Crank Example.....	7-1
7.3	Using <i>SOLIDWORKS Motion</i>	7-4
7.4	Result Verifications.....	7-12
	Exercises	7-16

Lesson 8: A Slider-Crank Mechanism—Event-Based Dynamic Simulation

8.1	Overview of the Lesson.....	8-1
8.2	Event-Based Motion Analysis.....	8-1
8.3	The Slider-Crank Example.....	8-2
8.4	Using <i>SOLIDWORKS Motion</i>	8-4
	Exercises	8-13

Lesson 9: A Rail Carriage Example

9.1	Overview of the Lesson.....	9-1
9.2	The Rail Carriage Example	9-2
9.3	Using <i>SOLIDWORKS Motion</i>	9-4
	Exercises	9-9

Lesson 10: A Compound Spur Gear Train

10.1	Overview of the Lesson.....	10-1
10.2	The Spur Gear Train Example.....	10-1
10.3	Using <i>SOLIDWORKS Motion</i>	10-5
	Exercises	10-9

Lesson 11: Planetary Gear Train Systems

11.1	Overview of the Lesson.....	11-1
------	-----------------------------	------

11.2 The Planetary Gear Train Examples.....	11-2
11.3 Using <i>SOLIDWORKS Motion</i> : Single Planetary Gear Train.....	11-9
11.4 Using <i>SOLIDWORKS Motion</i> : Multi-Planetary Gear Train.....	11-13
Exercises	11-16

Lesson 12: Cam and Follower

12.1 Overview of the Lesson.....	12-1
12.2 The Cam and Follower Example.....	12-1
12.3 Using <i>SOLIDWORKS Motion</i>	12-5
Exercises	12-10

Lesson 13: Simulation of Recreational Waterslide

13.1 Overview of the Lesson.....	13-1
13.2 The Analytical Calculation Method	13-1
13.3 The Waterslide Example	13-4
13.4 Experimental Validation.....	13-6
13.5 The Motion Study Model	13-8
13.6 Using <i>SOLIDWORKS Motion</i>	13-11

Lesson 14: Kinematic Analysis of a Racecar Suspension

14.1 Overview of the Lesson.....	14-1
14.2 The Quarter Suspension	14-2
14.3 Using <i>SOLIDWORKS Motion</i>	14-15

Appendix A: Defining Joints..... A-1

Appendix B: The Units System B-1