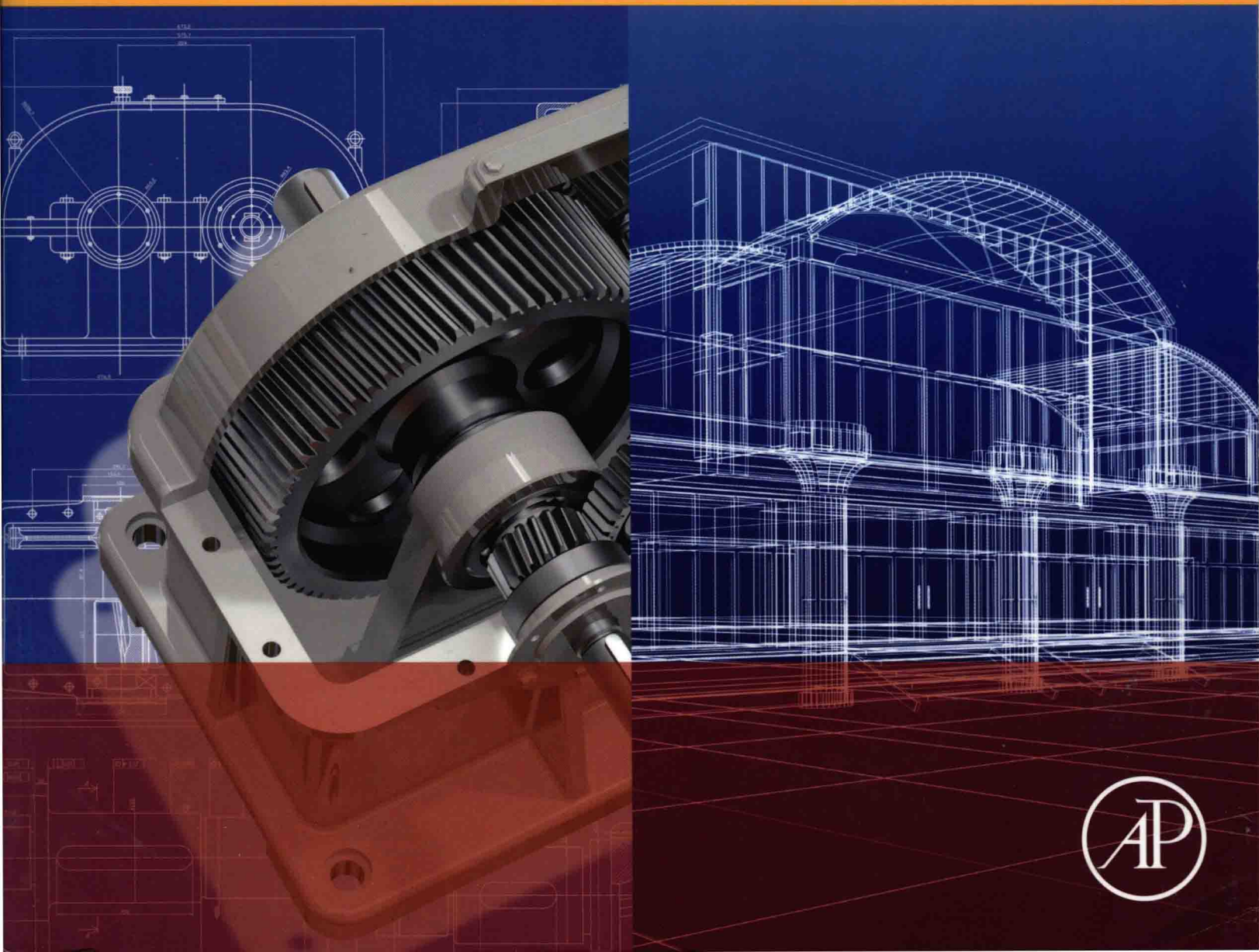
Up and Running with AutoCAD® 2014

2D and 3D Drawing and Modeling

Elliot Gindis



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Finally, I thank my friends and family, especially my parents, Boris and Tatyana Gindis, for their patience and encouragement as well as standing by me as months of work turned into years.

This book is dedicated to the hundreds of students who have passed through my classrooms and made teaching the enjoyable adventure it has become.

Elliot Gindis
April 2014

ABOUT THE AUTHOR

Elliot J. Gindis started out using AutoCAD professionally in a New York City area civil engineering company in September 1996, moving on to consulting work shortly afterward. He has since drafted in a wide variety of fields ranging from all aspects of architecture and building design to electrical, mechanical, civil, structural, aerospace, and rail design. These assignments, including lengthy stays with IBM and Siemens Transportation Systems, totaled over 50+ companies to date.

In 1999, Elliot began teaching part-time at Pratt Institute of Design, followed by positions at Netcom Information Systems, RoboTECH CAD solutions and more recently at New York Institute of Technology. In 2003, he formed Vertical Technologies Consulting and Design (www.VTCDesign.com), an AutoCAD training firm that continues to train corporate clients nationwide in using and optimizing AutoCAD.

Elliot holds a bachelor's degree in aerospace engineering from Embry Riddle Aeronautical University, and a master's degree in mechanical engineering from Mercer University. As of 2009, he resides in the Atlanta area and is a structural and systems engineer for the United States Air Force. He also continues to be involved with AutoCAD education and CAD consulting. *Up and Running with AutoCAD 2014*, which carefully incorporates lessons learned from 17 years of teaching and industry work, is his seventh overall textbook on the subject. His 2012 textbook has also been translated, and is available in Spanish from Anaya Multimedia. He can be reached at: Elliot.Gindis@gmail.com.

Previous textbooks by Elliot Gindis:

Operational AutoCAD 2008, New York (NY): Netcom Inc. (out of print)
Up and Running with AutoCAD 2009 [e-book only], Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2010, – Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2011—2D Drawing and Modeling, Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2011—2D and 3D Drawing and Modeling, Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2012—2D Drawing and Modeling, Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2012—2D and 3D Drawing and Modeling, Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2013—2D Drawing and Modeling, Waltham (MA): Elsevier, Inc.
Up and Running with AutoCAD 2013—2D and 3D Drawing and Modeling, Waltham (MA): Elsevier, Inc.
AutoCAD 2012—Dibujar y Modelar en 2D y 3D [in Spanish], Madrid (Spain): Anaya Multimedia.

PREFACE

WHAT IS AUTOCAD?

AutoCAD is a drafting and design software package developed and marketed by Autodesk®, Inc. As of 2013, it has been around for approximately 31 years—several lifetimes in the software industry. It has grown from modest beginnings to an industry standard, often imitated, sometimes exceeded, but never equaled. The basic premise of its design is simple and is the main reason for AutoCAD's success. Anything you can think of, you can draw quickly and easily. For many years, AutoCAD remained a superb 2D electronic drafting board, replacing the pencil and paper for an entire generation of technical professionals. In recent releases, its 3D capabilities finally matured, and AutoCAD is now also considered an excellent 3D visualization tool, especially for architecture and interior design.

The software has a rather steep learning curve to become an expert but a surprisingly easy one to just get started. Most important, it is well worth learning. This is truly global software that has been adopted by millions of architects, designers, and engineers worldwide. Over the years, Autodesk expanded this reach by introducing add-on packages that customize AutoCAD for industry-specific tasks, such as electrical, civil, and mechanical engineering. However, underneath all these add-ons is still plain AutoCAD. This software remains hugely popular. Learn it well, as it is still one of the best skills you can add to your resume.

ABOUT THIS BOOK

This book is not like most on the market. While many authors certainly view their particular text as unique and novel in its approach, I rarely reviewed one that was clear to a beginner student and distilled AutoCAD concepts down to basic, easy to understand explanations. The problem may be that many of the available books are written by either industry technical experts or teachers but rarely by someone who is actively both. One really needs to interact with the industry and the students, in equal measure, to bridge the gap between reality and the classroom.

After years of AutoCAD design work in the daytime and teaching nights and weekends, I set out to create a set of classroom notes that outlined, in an easy to understand manner, exactly how AutoCAD is used and applied, not theoretical musings or clinical descriptions of the commands. These notes eventually were expanded into the book that you now hold. The rationale was simple: I need this person to be up and running as soon as possible to do a job. How do we make this happen?

TEACHING METHODS

My teaching approach has its roots in a certain philosophy I developed while attending engineering school many years ago. While there, I had sometimes been frustrated with the complex presentation of what in retrospect amounted to rather simple topics. My favorite quote was, "Most ideas in engineering are not that hard to understand but often become so upon explanation." The moral of that quote was that concepts can usually be distilled to their essence and explained in an easy and straightforward manner. That is the job of a teacher: Not to blow away students with technical expertise but to use experience and top-level knowledge to sort out what is important and what is secondary and to explain the essentials in plain language.

Such is the approach to this AutoCAD book. I want everything here to be highly practical and easy to understand. There are few descriptions of procedures or commands that are rarely used in practice. If we talk about it, you will likely need it. The first thing you must learn is how to draw a line. You see this command on the first few pages of Chapter 1. It is essential to present the "core" of AutoCAD, essential knowledge common to just about any drafting situation, all of it meant to get you up and running quickly. This stripped down approach proved effective in the classroom and was carefully incorporated into this text.

TEXT ORGANIZATION

This book comes in three parts: Level 1, Level 2, and Level 3:

Level 1 (Chapters 1–10) is meant to give you a wide breadth of knowledge on many topics, a sort of "mile wide" approach. These ten chapters comprise, in my experience, the complete essential knowledge set of an intermediate user. You then can work on, if not necessarily set up and manage, moderate to complex drawings. If your CAD requirements are modest or if you are not required to draft full time, then this is where you stop.

Level 2 (Chapters 11–20) is meant for advanced users who are CAD managers, full-time AutoCAD draftspersons, architects, or self-employed and must do everything themselves. The goal here is depth, as many features not deemed critically important in Level 1 are revisited to explore additional advanced options. Also introduced are advanced topics necessary to set up and manage complex drawings.

Level 3 (Chapters 21–30) is all about 3D. Solid knowledge of the previous two levels is highly recommended before starting these chapters. The 3D material covers all aspects of AutoCAD solid modeling including lights and rendering.

Throughout the book, the following methods are used to present material:

- Explain the new concept or command and why it is important.
- Cover the command step by step (if needed), with your input and AutoCAD responses shown so you can follow and learn them.
- Give you a chance to apply just-learned knowledge to a real-life exercise, drawing, or model.
- Test yourself with end-of-chapter quizzes and drawing exercises that ask questions about the essential knowledge.

You will not see an extensive array of distracting "learning aids" in this text. You will, however, see some common features throughout, such as

Commands: These are presented in almost all cases in the form of a command matrix, such as the one shown here for a line. You can choose any of the methods for entering the command.	*Keyboard:* Type in **line** and press Enter *Cascading menus:* **Draw→Line** *Toolbar icon:* **Draw** toolbar  *Ribbon:* **Home tab→Line** 
Tips and tricks: These are seen mostly in the first few chapters and one is shown here. They are very specific, deliberate suggestions to smooth out the learning experience. Do take note.	**TIP 1:** The Esc (escape) key in the upper left-hand corner of your keyboard is your new best friend. It gets you out of just about any trouble you get yourself into. If something does not look right, just press the Esc key and repeat the command. Mine was worn out learning AutoCAD, so expect to use it often.

Step-by-step instructions: These are featured whenever practical and show you exactly how to execute the command, such as the example with line here. What you type in and what AutoCAD says are in the default font: `Courier New`. The rest of the steps are in the standard print font.	**Step 1.** Begin the line command via any of the previous methods. • AutoCAD says: `Specify first point:` **Step 2.** Using the mouse, left-click anywhere on the screen. • AutoCAD says: `Specify next point or [Undo]:` **Step 3.** Move the mouse elsewhere on the screen and left-click again. You can repeat Step 2 as many times as you wish. When you are done, click Enter or Esc.
Learning objectives and time for completion: Each chapter begins with this, which builds a "road map" for you to follow while progressing through the chapter, as well as sets expectations of what you will learn if you put in the time to go through the chapter. The time for completion is based on classroom teaching experience but is only an estimate. If you are learning AutoCAD in school, your instructor may choose to cover part of a chapter or more than one at a time.	In this chapter, we introduce AutoCAD and discuss the following: • Introduction and the basic commands • The Create Objects commands • The Edit and Modify Objects commands • The View Objects commands, etc. By the end of the chapter, you will… Estimated time for completion of chapter: 3 hours.
Summary, review questions, exercises: Each chapter concludes with these. Be sure to not skip these pages and to review everything you learned.	**SUMMARY** **REVIEW QUESTIONS** **EXERCISES**

WHAT YOUR GOAL SHOULD BE

Just learning commands is not enough; you need to see the big picture and truly understand AutoCAD and how it functions for it to become effortless and transparent. The focus after all is on your design. AutoCAD is just one of the tools to realize it.

A good analogy is ice hockey. Professional players do not think about skating; to them it is second nature. They are focused on strategy, scoring a goal, and getting by the defenders. This mentality should be yours as well. You must become proficient through study and practice, to the point where you are working with AutoCAD, not struggling against it. It then becomes "transparent" and you focus only on the design, to truly perform the best architecture or engineering work of which you are capable.

If you are in an instructor-led class, take good notes. If you are self-studying from this text, pay very close attention to every topic; nothing here is unimportant. Do not skip or cut corners, and complete every drawing assignment. Most important, you have to practice, daily if possible, as there is no substitute for sitting down and using the software. Not everyone these days has the opportunity to learn while working and getting paid; companies want ready-made experts and do not want to wait. If that is the case, you have to practice on your own in the evening or on weekends. Just taking a class or reading this book alone is not enough.

It may seem like a big mountain to climb right now, but it is completely doable. Once on top, you will find that AutoCAD is not the frustrating program it may have seemed in the early days but an intuitive software package that, with proficiency of use, becomes a natural extension of your mind when working on a new design. That, in the end, is the mark of successful software; it helps you do your job easier and faster. Feel free to contact me with questions or comments at Elliot.Gindis@gmail.com, or visit my website at www.vtcdesign.com. Good luck!

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