Computer-Aided Design with progeCAD

1st edition

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FOREWORD

Everything is connected to everything else.

According to the chaos theory in mathematics and physics, it is possible for a butterfly to flap its wings at one end of the world and create a hurricane at the opposite end. (Hence the more popular term “butterfly effect.”) Similarly, the little things that we do may have an impact on society in ways that we can never expect.

Technology is a large factor in linking us to other people. Because of computers and the Internet, we are now connected to virtually everyone in the world. Furthermore, communication has never been quicker and more efficient. With the Information Superhighway, we have access to all sorts of data and gadgets. This would not have been possible a mere twenty years ago. Thus, we need to be aware that we can affect and influence others just by being able to send e-mails, design websites, create presentation reports, compile databases, or make audio/video files.

Our courseware is specifically designed to equip the students with the necessary knowledge and skills so they can navigate the terrain of present technology. Consider this book as a guide to strengthening human productivity and a tool for exploring the twenty-first century.

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Series Editor
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INTRODUCTION

This courseware aims to teach students the basics of Computer-Aided Design (CAD) and make them aware of its importance as well as application in today’s design industry. It includes an introduction to the use of CAD software in information and communication technologies for analysis, programming, design, and facilities management in various fields.

It is a practical, exercise-based learning using lessons that are output-oriented. Completion of the course will empower students with the knowledge and skills they need to be confident in this age of do-it-yourself drafting and designing.

LEARNING GOALS

By the end of this courseware, the student is expected to:

1. understand the role of computers and digital technology in the application of technical and creative design works;

2. be aware of the various digital methods and options available for study and presentation in the professional design environment; and

3. show competency in computer-aided design (CAD) software applications and techniques.
Jack Ryder smiled. There was no mortal use in explaining to Jinny Jeffries that his life on the desert was the only life in the world, that his ruins held more thrills than all the fevers of her tourist crowds, and that he would rather gaze upon the mummied effigy of any lady of the dynasty of Amenhotep than upon the freshest and fairest of the damsels of the present day.

It would only tax Jinny's credulity and hurt her feelings. And he liked Jinny—though not as he liked Queen Hatasu or the little nameless creature he had dug out of a king's ante-room.

—from *The Fortieth Door*, a 1924 American Adventure Film written by Mary Hastings Bradley and Frank Leon Smith
**Drawing in the Blue: An Overview**

In *The Fortieth Door*, Jack Ryder is described as a character focused on his work exploring ruins and discovering artifacts in them. Without hesitation, he would explore a newly discovered chamber in the Cheops pyramid even if it is a risky undertaking. What would make his job easier is for him to use blueprints or diagrams of the ruins he’ll be exploring. In the early 20th century, these diagrams were painstakingly mechanically hand-drawn based on descriptions, established measurements, and existing photographs. Mistakes are costly with the risk of inaccurate representations. Imagine what would Ryder give in exchange for detailed mechanical drawings or accurate blueprints of ancient buildings made with computers?

**Drawing Hard**

What are mechanical drawings?

Mechanical drawings, traditionally called blueprints because of the bluish dye used in making copies, are architectural or engineering plans created with hard tools like rulers, the t-square, the compass, pencils and pens for the purpose of showing how something has to be constructed, installed or manufactured. It is the traditional way of drawing technical illustrations and diagrams. Mechanical drawings can be those of buildings, bridges, automobiles, airplanes, etc. Standards are used to make these drawings easy for the viewer to comprehend and understand. Each mechanical drawing has only one intended meaning as opposed to an artistic drawing, which can be interpreted subjectively by the viewer and can mean more than one thing.
Today, there are two major methods in creating mechanical drawings. First is by drawing manually with the use of drafting instruments. Second is with the use of Computer-Aided Design or CAD.

**Drawing Soft**

CAD is a well-known acronym that stands for Computer-Aided Design. CAD is defined as “the creation, modification, analysis or optimization of a design with the use of computers.” It is also known as Computer-Aided Drafting (CAD) or Computer-Aided Design and Drafting (CADD). CAD not only involves creating drawings on a computer, but it also aids in properly showing the information represented by the drawings.

According to the CAD history website CADAZZ, the beginnings of CAD software date back to 350 B.C. from the mathematician Euclid of Alexandria. His work, particularly his expositions in his treatise called “The Elements,” led to the development of Euclidean geometry, which became the basis for the software systems that exist today.

In the 1960s, the first true CAD software was conceived. However, because computers during that time were costly, only the large companies manufacturing automobiles and aircrafts first used CAD commercially. Using CAD enabled those companies to create multiple two-dimensional drawings of their models that demanded mechanical precision in manufacturing.

Today, CAD has taken an important part in the manufacturing and building industries as it has become the standard tool used in creating two-dimensional and three-dimensional drawings (two dimensional drawings are basically drawn “flat” while three dimensional drawings are drawn with volumes to create objects that may be perceived to have depth). CAD continues to be popular because it is easy to use, efficient, and essential in making designs that are useful to our modern industries.

**CAD Vs. Manual Drawing**

There are two major aspects that define the difference between manual drawing and CAD drawing. First are methodological differences. When drawing objects manually, the whole object is created on paper using a chosen drawing tool like the pencil and ruler. With CAD, the user only needs to indicate specific points, locations and measurements in the drawing space, then the computer generates or draws the objects on its own.
The second are fundamental differences. All manually drawn objects are not as exact in measurement as those objects drawn using the computer. Measurements of each manually drawn object will depend on the instrument used and how a person reads it; likewise, the position of drawings on the paper is fixed unless they are erased and drawn again. With CAD-drawn objects, however, each measurement is mathematically accurate up to 8 decimal places. An object needs to be drawn only once, can be copied many times, and may be moved to another location easily.

The CAD Way

CAD's use of computer systems makes it beneficial in many ways. For one, it increases the productivity of the designer. Using CAD, the designer is able to better visualize the product that he is conceptualizing. CAD enables easy manipulation of models and gives the designer the capability to study and modify his design faster. Thus, he can finish projects in shorter spans of time as well as lower the cost of design production.

CAD also improves the quality of design. As a system, it enables the user to analyze the drawings and data faster. It is also capable of calculating the inputs so that errors in the process are lessened and the drawings produced become more accurate.

With CAD, communication is also improved through documentation because the user will be able to produce drawings that can be understood and read easily. The software has more features that allow designers to standardize their drawings and it also aids in translating the design into drawn form.

Processes in CAD

With CAD, you can perform a number of processes which include creating objects, modifying objects, drawing organizational graphics and annotations, and laying out and plotting.

Objects are created by generating drawing entities inside the program. As drawn entities, they are modified through the alteration and changing of dimensions and properties. Then with the use of organizational graphics and annotations, drawing entities may be sorted, arranged, and labeled along with measurement indicators. Finally, laying out and plotting allows the setting up of drawings for printouts.

Grasping CAD

There are various CAD software available in the market today. Each one is defined by its functionality and whether it is easy to use or not. The software that will be used for the duration of the course is progeCAD 2013. It is one of the most competitive software in terms of function and price.
CAD software normally require training because of the complex user interface. In this lesson, you will become familiar with the drawing interface of the featured CAD software as well as learn how to go about making adjustments to suit your needs as a user.

**Starting the CAD Software**

Assuming that the progeCAD software is already installed in the computer, these are the steps to open the program:

1. Turn on the computer and log on to Windows.
2. Click the **Start** button.
3. Click **All Programs**, open the progeCAD 2013 folder, then click **progeCAD 2013**.

**The CAD User Interface**

1. **Title Bar** – shows the name of the program and the filename
2. **Pull-down Menus** – these are the traditional menu navigations for Windows where all functions can be accessed
3. **Toolbars** – access commands by clicking on the buttons; commands in each toolbar are sorted according to function
4. **Model Space** – the drawing space
5. **Crosshair** – the pointing device in CAD software
6. **UCS Icon** – stands for User Coordinate System; shows the current drawing orientation
7. **Model & Layout Tabs** – allows the user to move from the current drawing space to another
8. **Command Window** – input area for commands and measurements; prompts the user for options in commands
9. **Status Bar** – shows coordinate location of crosshair and status of drawing modes
**Setting up the Drawing Interface**

The CAD interface can be adjusted to a certain extent depending on the needs of the user. The toolbars and the command window can be moved to any floating position on the screen or docked to any side of the screen.

The user can also turn the toolbars, the command window, the drawing tabs, and the status bar on and off. To show and hide these entities:

1. Right-click on any existing open toolbar.
2. Select progeCAD to show list.
3. Check or uncheck the entities shown on the list.

**Adjusting System Variables**

Fine-tuning of the CAD software is done on the Options and Drawing Settings dialog boxes. These can be accessed from the pull-down menu Tools, then Options or Drawing Settings.

**Options**

- general and autosave options
- paths and files target location
- display options
- selection options
- crosshair options
- user profiles
- printing variables
- snapping options

The Options dialog box displays the system and program variable adjustments.
**Drawing Settings**

The Drawing Settings dialog box displays the drawing and input variable adjustment settings.

Some of the commands that will be encountered in the duration of the course will refer back to specific tabs in the Drawing Settings dialog box for input and adjustments.

**Working with Menus and Toolbars**

Before creating and modifying drawings, it is necessary to know how to access the commands and tools. There are two methods to activate these. First is with the use of the pull-down menus and the other is through the use of the toolbars. Almost all the commands and tools for the program are sorted in each pull-down menu and toolbar.

**Working with the Command Window**

The command window is also used for input of the commands and tools for the software. It has access to other commands for tweaking the software further which cannot be found in the pull-down menus and toolbars. This window is also where the CAD software user “communicates” with the program to input measurements for drawn objects and to go to sub-functions within each command, among other things. The course will heavily rely on activating functions with the use of the command window with references on how to access the same function using pull-down menus and toolbars.
Drawing in the Blue: An Overview
Computer-Aided Design with progeCAD

SELF-CHECK

1. What are the advantages of Computer-Aided Design (CAD)?
2. What were the earliest commercial uses of CAD?

SKILLS WARM-UP

Encircle the correct answer.

1. The CAD industry is an integral part of the manufacturing and building industry and is the standard tool used in creating two-dimensional and ___________.
   - three-dimensional drawings
   - four dimensional drawings

2. Which is not needed when using CAD to produce the drawing you indicated?
   - pencil
   - keyboard
   - mouse

3. CAD stands for Computer-Aided Design or Computer-Aided Drafting. How about CADD?
   - Computer-Aided Design and Drafting
   - Computer-Aided Design and Development
   - Computer-Aided Document and Design

4. Who were the earliest commercial users of CAD?
   - Astronauts
   - Automative companies
   - Architects

5. With CAD-drawn objects, each measurement is mathematically accurate up to:
   - 12 decimal places
   - 8 decimal places
   - 10 decimal places
6. There are two major aspects that define the difference between manual drawing and CAD drawing. Which does not belong here?

   Methodological Differences  
   Fundamental Differences  
   Mechanical Differences

7. Why is the CAD industry an integral part of the manufacturing and building industry?

   It is easy to use and efficient.  
   It is cheap.

8. With the use of CAD, design errors are reduced by the accuracy of the system by means of calculations.

   True  
   False

9. CAD not only involves creating drawings on a computer, but it also conveys ________.

   proper information represented by the drawings.  
   accuracy of the system

10. Which one of these is an advantage of using CAD?

   It provides more information.  
   It improves communication through documentation.  
   You cannot easily erase, resize and rotate the object being drawn.

**SKILLS WORKOUT**

Explore the CAD User Interface and see how you can find the following operations.

1. Describe the procedure of the following operations:

   a. How to turn the toolbars, command window, drawing tabs, and status bar on and off

   b. How to access the commands and tools to be able to create and modify your drawings

2. Find the different system and program variable adjustments in the Options dialog box.

3. The command window is a very important tool in CAD drawing. Explain how it works and why it is important.
SUMMARY

Computer-Aided Design (CAD) is an important component in today’s modern industries. With its use, drawings can easily be produced and reproduced in less time and effort. Standardization of drawings with CAD is now more developed, which opens up various opportunities for its use in technical and creative design works.

Many types of CAD software are available today. Each one has its own standards and functionality to better assist the user in drawing. But the basic operation of CAD software remains the same wherein the main tool used is the command window. The toolbars and menus can vary from program to program but the command window will always be present and available to the user.

WORD BANK

- **CAD** – Computer-Aided Design
- **CADD** – Computer-Aided Design and Drafting
- **Crosshair** – a type of cursor consisting of two lines that intersect
- **UCS** – stands for User Coordinate System, it determines the default placement of geometry in a drawing
- **Command Window** – text window that is standard in CAD software for inputting commands and measurements

GROUP WORK

Form groups of three. All members will research the benefits and uses of CAD in our modern industries. See if you can identify uses of CAD for ordinary people with a casual lifestyle. Make a simple presentation and report this in class.
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www.techfactorsinc.com/store