



University of Engineering &
Technology Peshawar

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of engineering excellence

Course Name: Introduction to CAD CAM

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CAD (Computer aided Designing)

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- ❑ CAD (Computer Aided Design) is the use of computer software to design and document a product's design process.
- ❑ Originally CAD includes any technique that use computers in the design process including drafting, stress analysis, thermal analysis, etc.
- ❑ But over the last 35 years, CAD has come to refer more specifically to Computer Aided Design and Drafting.
- ❑ CAD program/software is an electronic tool that enables you to make quick and accurate drawings with the use of a computer.

CAD (Computer aided Designing)

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- CAD is used to accomplish preliminary design and layouts, design details and calculations, creating 3-D models, creating drawings, as well as interfacing with analysis, marketing, manufacturing.
- CAD is currently widely used for industrial products, animated movies and other applications. A special printer or plotter is usually required for printing professional design renderings.
- CAD software enables
 1. Efficiency in the quality of design
 2. Increase in the Engineer's productivity
 3. Improve record keeping through better documentation and communication

Types of CAD Software

Since its introduction in late 1960's, CAD software has improved by leaps and bounds. A broad classification of CAD is:

□ **2D CAD**

2D CAD is the pioneer of CAD software, and was developed in the early 70s. At that time, major automobile, aerospace and other engineering companies developed in-house tools to automate repetitive drafting requirements. 2D CAD relies on basic geometric shapes like lines, rectangles, circles, etc. to produce flat drawings. These types of software have been first developed way back in 1970's. AutoDesk is one of the pioneering companies that has played a significant role in developing CAD software.

□ **3D CAD**

As the processing power of computers increased and the graphic display capabilities improved, 3D CAD has become an increasingly popular design tool. 3D CAD allows creation of 3D images that are realistic. These images are called 3D models as they can be viewed and rotated in any direction – X, Y or Z. You can also display views from a 3D model, such as isometrics or perspectives, from any angle using 3D CAD.

Types of CAD Software

3D CAD can be further classified as:

- **Wire-frame models** – they create skeleton like models with lines and arcs. Since they appear to be made of wires, and everything in the background is visible, they are called wire-frame models. They are not very popular anymore.
- **Surface models** – unlike wire frames, these models are created by joining 3D surfaces. Since nothing in the background is visible, the surface models are quite realistic.
- **Solid models** – they are considered to be the most useful CAD models. Although they appear to be the same as surface models, they also have additional properties like weight, volume and density, just like actual physical objects. These models are commonly used as prototypes to study engineering designs.

Computer-aided manufacturing (CAM)

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- ❑ Computer-aided manufacturing (CAM) is the use of software to control machine tools and related ones in the manufacturing of work pieces.
- ❑ CAM may also refer to the use of a computer to assist in all operations of a manufacturing plant, including planning, management, transportation and storage.
- ❑ Its primary purpose is to create a faster production process and components and tooling with more precise dimensions and material consistency, which in some cases, uses only the required amount of raw material (thus minimizing waste), while simultaneously reducing energy consumption.
- ❑ CAM is a subsequent computer-aided process after computer-aided design (CAD) and sometimes computer-aided engineering (CAE), as the model generated in CAD and verified in CAE can be input into CAM software, which then controls the machine tool.
- ❑ CAM system also include real time controls and robotics.

Introduction to AutoCAD & History

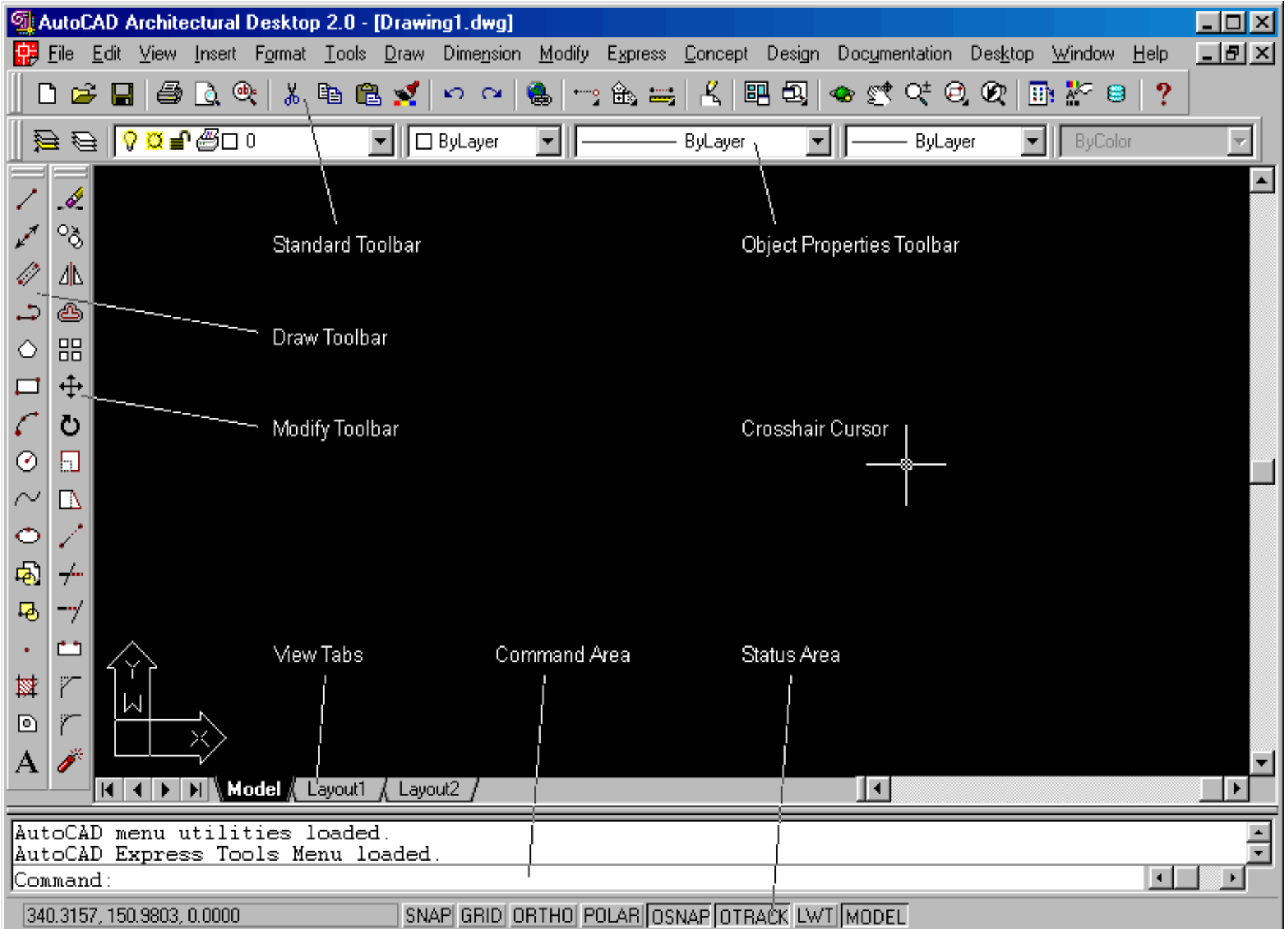
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- AutoCAD is a commercial computer-aided design and drafting software application which is an interactive drawing system designed to permit a user to construct or edit a drawing on a graphics display screen.
- It was initially developed in the early 1980's by Autodesk Inc., California.
- It is, by many estimations, the largest program in terms of computer code ever written for a personal computer.
- AutoCAD is a relatively easy program to use after you understand a few basics.
- AutoCAD provides a set of entities for constructing your drawing. An entity is a drawing element such as a line, circle, or text string.
- AutoCAD is used across a wide range of industries, by architects, project managers, engineers, graphic designers, and many other professionals. It was supported by 750 training centers worldwide in 1994.
- From 1982 to 2017= 22 Versions of AutoCAD has been released world wide.

The AutoCAD Interface

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- **Menu bar** Contains the menus
- **Toolbars** Contain tools, represented by icons, that start commands
- **Cursor menu** Display a menu at cursor location.
- **Crosshairs** Controlled by pointing device (a mouse)
- **Drawing window** Where AutoCAD displays your drawing and where you work on your drawing
- **Command window** Where commands are entered from keyboard and AutoCAD displays prompts and messages.
- **Text window** Displays a history of the commands and options you have entered.
- **Status bar** Displays the coordinate location of your crosshairs and the current setting of grid, snap, and other drawing aids.



Drawing Basics

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- The most **important difference** between CAD drawings and other computer graphics is the way the drawing is saved and used.
- Computer images (non CAD images) are **bitmaps**. Bitmaps are a grid made up of thousands of dots. Bitmap images lend themselves to computers because the monitor screens and printers already talk the language of bitmaps, a map made up of tiny bits.
- The CAD drawing, however, is like a pencil drawing made up of lots of lines. This is a **vector image**. Each line in the vector drawing is a **mathematical curve**.
- When you click the mouse to start and finish a line, the resulting line becomes a **mathematical formula** with a point of beginning, an end point, a thickness, a color, and a style (dashed, solid, dotted etc).

Drawing Basics

- Up until **Release 10**, AutoCAD was essentially a two-dimensional **(2D)** drawing system.
- Following that release, it now supports a full three-dimensional **(3D)** database.
- This has had the effect that the features of AutoCAD that support two-dimensional drawing are fully self-contained and can still be used as a **2D system** without being concerned with its 3D features.
- From **release 11** onwards, AutoCAD has provided an extension package called **AME** (Advanced Modeling Extension) which provides 3D solid modeling capabilities - these allow you to form complex solid objects by adding, subtracting and intersecting a set of simple solid primitives (such as, boxes, cone, cylinders, spheres, etc.).
- In **this course** we will focus on the 2D drafting aspects of AutoCAD since that better reflects the way in which this system is generally used in practice at the present time.

What's in an AutoCAD drawing

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- An AutoCAD drawing is made up of **entities**.
- These can be either simple **graphic primitives** (such as lines, arcs, circles, text, and so on) or blocks (which are groups of entities).
- The graphic primitives are defined **geometrically** in terms of the normal Cartesian coordinate system (right-handed system with positive X-axis to the right, positive Y-axis up the screen and positive Z-axis coming out of the screen towards the user).
- For **example**, lines are defined by their end- point coordinates (x, y and z), while circles are defined by their centre coordinates and radius.
- Each entity also has **certain attributes** associated with it, such as line style, text font or color.

Entities (Objects)

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- Every object within an AutoCAD drawing is composed of one or more drawing **entities**.
- **Entities** are the basic parts from which all complex objects within a drawing are created.
- Each AutoCAD **drawing command** creates a specific entity type.
- The **modifying/editing commands** simply manipulate the entities that you have previously placed in the drawing, scaling them, copying them, or combining them to create a finished drawing.
- The AutoCAD program works with **17 different** entity types.
- All **objects** in a drawing consist of combinations of one or more of the following entities:
 - ◆ Arcs
 - ◆ Circles
 - ◆ Text
 - ◆ Points
 - ◆ Blocks
 - ◆ Attributes
 - ◆ Lines
 - ◆ Polylines
 - ◆ 3D
 - etc

AutoCAD Commands

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- **Drawing Commands:** Creates a specific entity type.
 - ▣ Point, Line, Circle, Arc, Polyline, Donut, Ellipse, Polygon, Rectangle, Text etc.

- **Modifying Commands:** Manipulates the entities.
 - ▣ Select, Erase, Copy, Move, Undo, Rotate, Change, Scale, Break, Trim, Fillet, Chamfer, Offset etc.

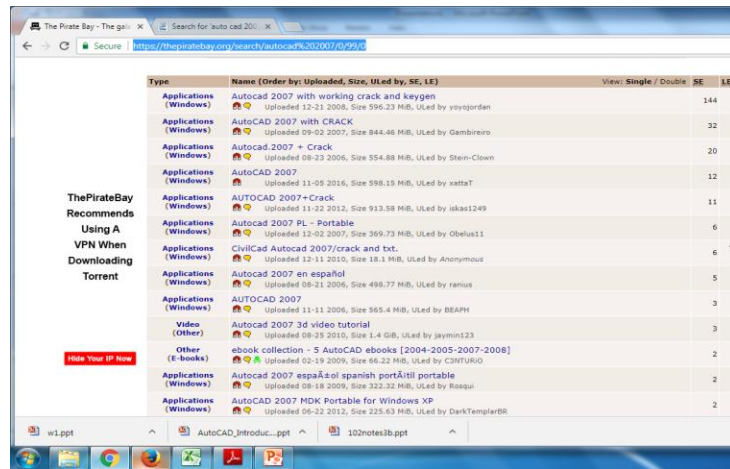
- **System Commands:**
 - ▣ New, Open, Save, Save as, Plot, Config, About, Quit, Help, Shell, List, Status, Area, Cal, etc.

Command Entry

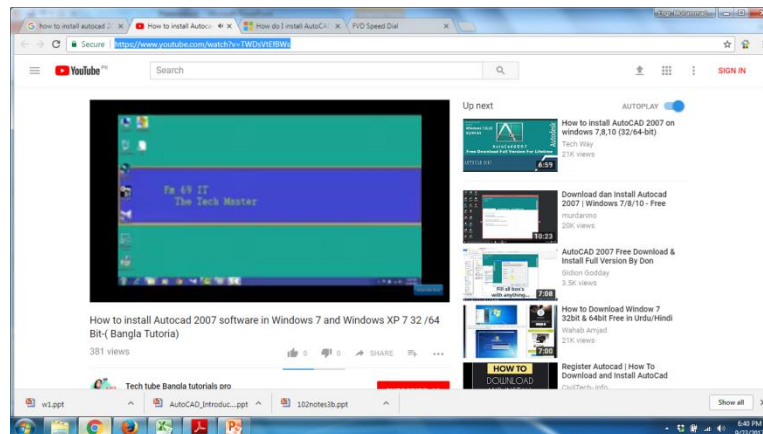
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- You can **enter** a command in any of the following ways:
 - 1. Menu bar
 - 2. Toolbars
 - 3. Keyboard
- To **enter** a command from the **keyboard**, simply type the command name and press either **spacebar**, **Enter**, **Tab** or the enter key on **mouse**.
- The important thing to remember is that AutoCAD will expect you give it information in a very **particular order**.
- The **command line** tells you what information AutoCAD requires to continue.

How to download & install AutoCAD 2007



<https://thepiratebay.org/search/autocad%202007/0/99/0>



<https://www.youtube.com/watch?v=TWDsVtEfBWs>