Main Applications of Computer Aided Design (CAD)

Solid Modelling

This process is used to create solid components of desired shape by joining and cutting different solid volumes. The final solid model is a virtual replica of an actual product but it can be seen and rotated like a real product. There are two main types:

- direct where the model can be edited by undoing or modifying the model directly on the 3D;
- parametric where the model is constructed using parameters (variable quantities such as measurements) and the model can be edited at any point in its history.

Surface Modelling

This process is used to create surfaces of desired shape by trimming, stitching and joining different surfaces to create a final shape model.

Assembly

This process is used to assemble the models created in solid or surface modelling to create a final assembly. This is used to see the actual fitment of all models and see the actual working of assembly.

Drafting Detailing

This process is used to create the 2D drawings of components or assemblies; usually directly from a 3D model, although 2D CAD can create 2D drawings directly.

Reverse Engineering

This process is used to convert the real component into 3D CAD Model. Different types of instruments such as laser scanner, white light scanner, CMM (coordinate measuring machine) etc. are used to measure or decode the shape of real model. The virtual model obtained can then be modified in a CAD program.

Main Applications of Computer Aided Manufacture (CAM)

Plotter/cutters
Using 2D CAD or graphics software these machines can draw or cut 2D shapes on paper, card or self-adhesive vinyl sheets.

Laser cutting
Using 2D CAD or graphics software these machines can cut or engrave a wide variety of materials such as card, plywood, acrylic sheet, textiles, glass.

2.5D Milling
Typically 2.5D machining uses 2D CAD files as the source and cuts in x and y directions (parallel to the machine bed) while lowering the tool progressively through several steps to cut out an object using a rotating tool. Setting tool paths is generally simple and the part cut rapidly.

3D Milling
3d machining typically used STL files from 3D CAD programs as a source and requires all three axes of the mill to be able to move simultaneously. 3D machining can take a very long time even on fast, modern machines and especially if a high quality finish is required. A fourth or rotary axis can also be added to create turned parts.

Turning
CAM software automates traditional turning on a lathe including roughing, grooving, threading and finishing for faster, more accurate results.

3D printing
3D printing is a process of making a three-dimensional object of virtually any shape from a digital model. It is achieved using an additive process where successive layers of material (usually thermoplastic) are laid down. Each layer is a thinly sliced, horizontal cross-section of the eventual object. Each object begins with a CAD file, created with a 3D modelling programme, or by reverse engineering.

The key benefits of CAD/CAM

- increased range of design ideas
- improved accuracy
- ease of modification
- repeatability of output
- quality of output
- reduction of wastage