

Lecture # 1.2 - Introduction

Computer Aided Machine Design and Drawing

Hardware, Software, and Industry Standards for 2026

Conventional Design Process

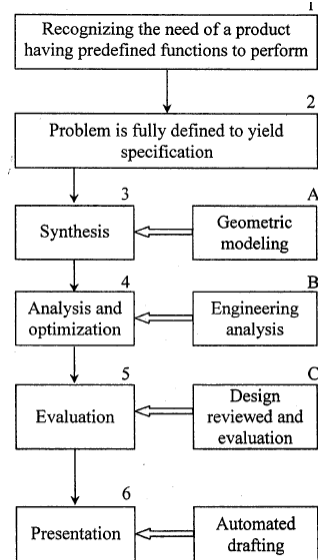
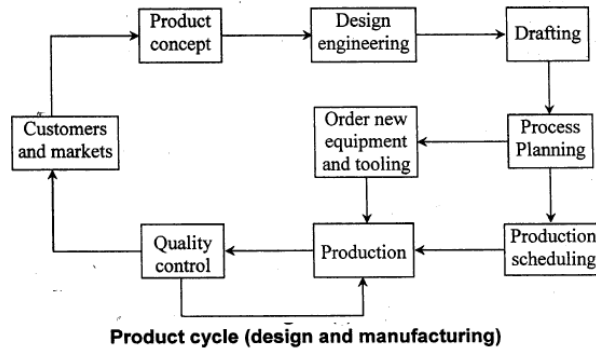


Figure
Six Stages Involved in Design

Product Life Cycle



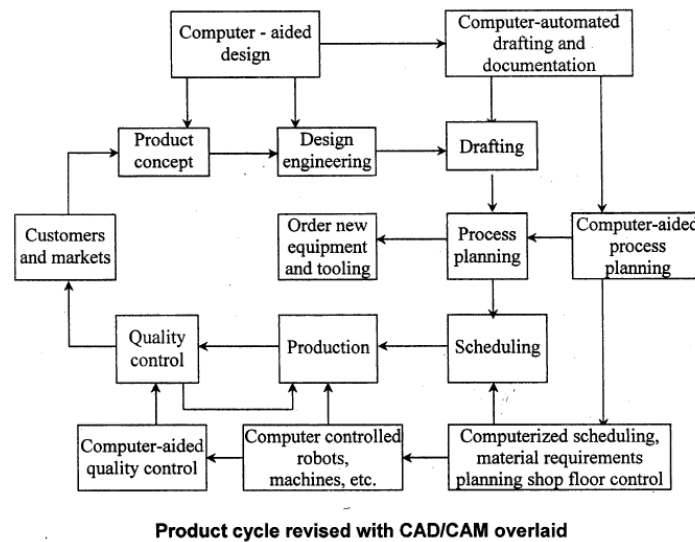
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Revised Product Life Cycle with CAD/CAM



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Computer-Aided Design (CAD)

Computer-Aided Design (CAD) is the use of computer systems to aid in the creation, modification, analysis, and optimization of design. It replaces manual drafting with a precise, digital workflow.

Key Benefits:

Increased Accuracy: Reduces human errors compared to manual drafting.

Efficiency: Automates common, repetitive processes.

Visualization: Ability to generate photorealistic renders and animations for better understanding.

Collaboration: Easy sharing and reviewing of files among global teams.



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CAD Hardware Components

To run modern CAD software in 2026, specialized hardware is essential:

Graphics Workstations:

High-performance CPUs with multi-core processing (8+ cores).

Memory (RAM):

Minimum 16GB for 2D; 32GB+ recommended for complex 3D assemblies.

Graphics Card (GPU):

Dedicated VRAM (8GB+) for real-time rendering and 3D visualization.

Display:

High-resolution monitors (4K) for intricate technical details.

Input Devices:

Precision mouse, trackpads, or digitizers.

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CAD Software Architecture

CAD software is typically categorized into two primary levels:

System Software:

The operating system (Windows/macOS) and hardware drivers that allow the computer to function.

Application Software:

The specific CAD programs used for design and analysis (e.g., [AutoCAD](#), [SolidWorks](#)).

Modern Layer (2026):

Cloud infrastructure for real-time collaboration and version control.

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CAD Software AutoCAD (Autodesk)

Primary Focus:

Market leader for 2D drafting and documentation, widely used in architecture and construction.

Top Features (2026 Context):

AI-Powered "Smart Blocks": Uses AI to automatically place or suggest blocks based on drawing context.

Specialized Toolsets: Includes industry-specific toolkits (e.g., Civil 3D, AutoCAD Architecture).

Web/Mobile Access: Allows users to edit and review designs across desktop, web browsers, and mobile devices.

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CAD Software SolidWorks (Dassault Systèmes)

Primary Focus:

A robust mid-to-high range CAD software primarily for mechanical engineering and product design.

Key Capabilities:

Parametric Modeling: Designers can make changes to dimensions, and the entire assembly updates automatically.

Assembly and Simulation: Used to test how thousands of individual parts fit together and perform under real-world conditions (stress/motion analysis).

Industry Standard: A highly desired skill set for mechanical design engineers.

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CAD Software Autodesk Fusion

Primary Focus:

A cloud-based, integrated platform that bridges the gap between design and manufacturing (CAD/CAM).

Why it's Unique in 2026:

Unified Workflow: Combines design, engineering (CAE), and manufacturing (CAM) processes into a single software environment.

Generative Design: AI helps explore thousands of optimized design outcomes based on specified constraints (e.g., weight reduction, material type).

Cloud Collaboration: Enables real-time team collaboration and robust version control.

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Key Takeaways

Key Takeaways:

CAD is a foundational technology revolutionizing design across architecture, engineering, and manufacturing.

Emerging Trends:

AI & Automation: Moving towards predictive and automated design processes.

Cloud & Connectivity: Seamless access and multi-user collaboration from anywhere.

VR/AR Integration: Designing and reviewing models using augmented and virtual reality.

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CAD

Benefits of CAD

- Improve accuracy of design, more standardize designs and engineering productivity
- Reduced engineering personnel requirements makes the management of design personnel on projects more effective
- Customer modifications are easier to make
- In analysis, easier recognition of component interactions provides better functional analysis to reduce prototype testing
- Minimized transcriptions errors and assistance in preparation of documentation
- Improved productivity in tool design provides the potential for using more existing parts and tooling
- Helps ensure designs are appropriate to existing manufacturing techniques
- Assistance in inspection of complicated parts
- Better communication interfaces and greater understanding among engineers, designers, drafters, management and different project groups.

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