# UNIT - 1

## Introduction to Computer Aided Design

↳ **Design:** Design is defined as a process of inventing a device or improving an existing device to meet human needs or to solve some problems.

Design means to formulate a plan for the satisfactio of a human need.

↳ **Engineering Design Process:**

Implementation of engineering methods & techniqu to invent or to modify an existing device is known as Engineering Design.

The engineering design has the following steps:

1. **Recognition of a Need:**

Needs are identified at many points in a business. Needs may come out from inputs of operation or service personnel or directly from the customers through sales or marketing representatives.

Needs usually arises from dissatisfaction with the existing situation to improve the existing situation They may be to reduce cost, increase reliability or performance etc.

## 2. Definition of a Problem :

It is the most critical step in the design process. It is always better to define the problem as possible. It should include objectives & goals of the problem, definition of any special technique or scientific terms, the various constraints placed on the design and the criteria that will be used to evaluate the design.

## 3. Gathering of Information :

It is also an important step in design process. Due to lack of design information, sometimes design solutions will fail in midway during the design process. The major source of information are technical reports or journal articles published by research and development institutes, company reports, patents, handbook of design & literature published by vendors & suppliers of material & equipment.

## 4. Conceptualization:

In this step various elements, mechanisms or processes in a design are to determined. In this step inventiveness & creativity is employed.

This step involves the formulation of model which may be either analytical or experimental. A major aspect of conceptualization is Synthesis

## 5. Evaluation:

Evaluation is a significant phase of the total design process. Evaluation involves the testing of a prototype in the laboratory as is the final proof a successful design. In this step two kinds of checks can be made on the design, which are:

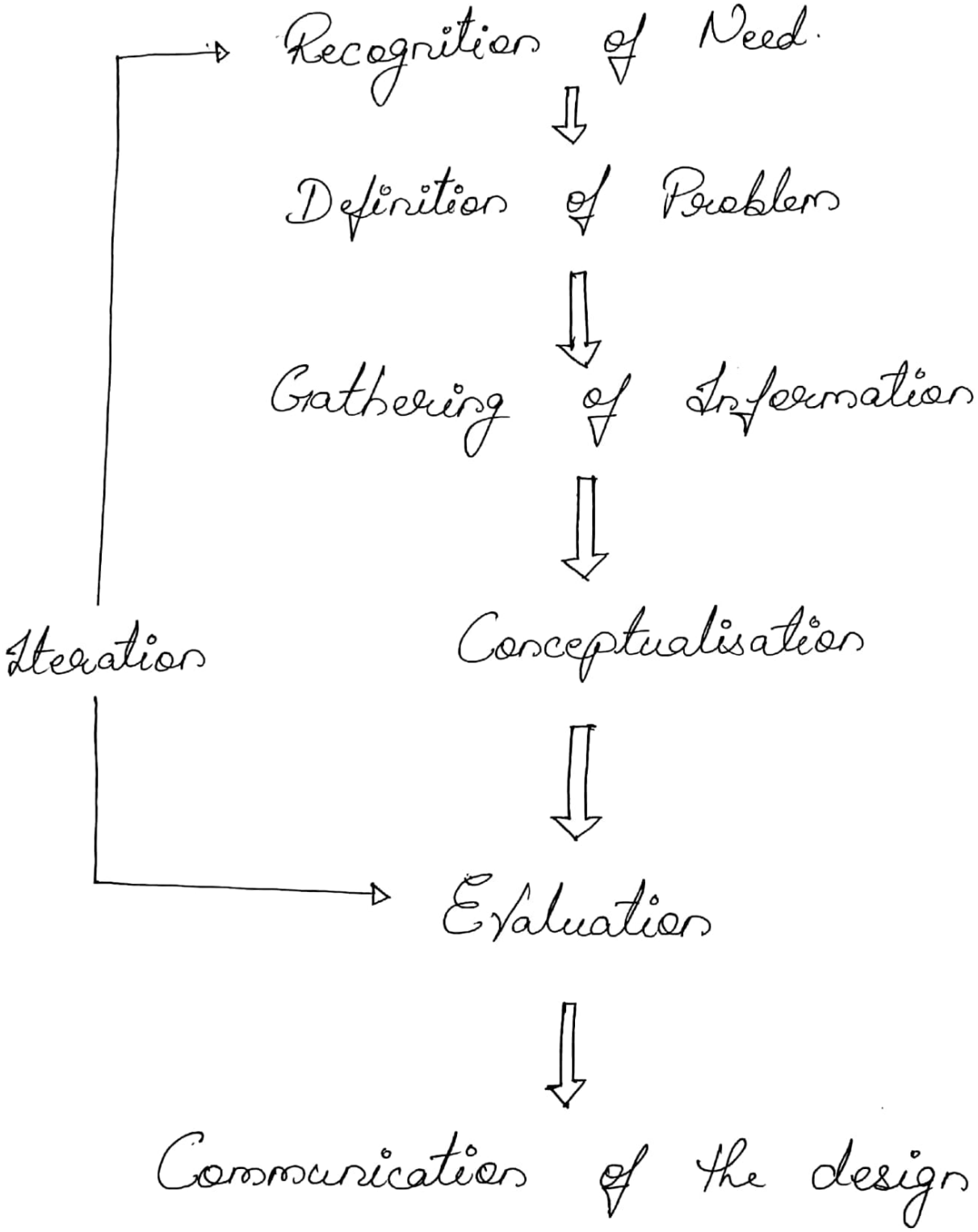
- Mathematical Checks
- Engineering Checks.

To select the best values of available design parameters, optimization techniques are employed.

## 6. Communication of the Design:

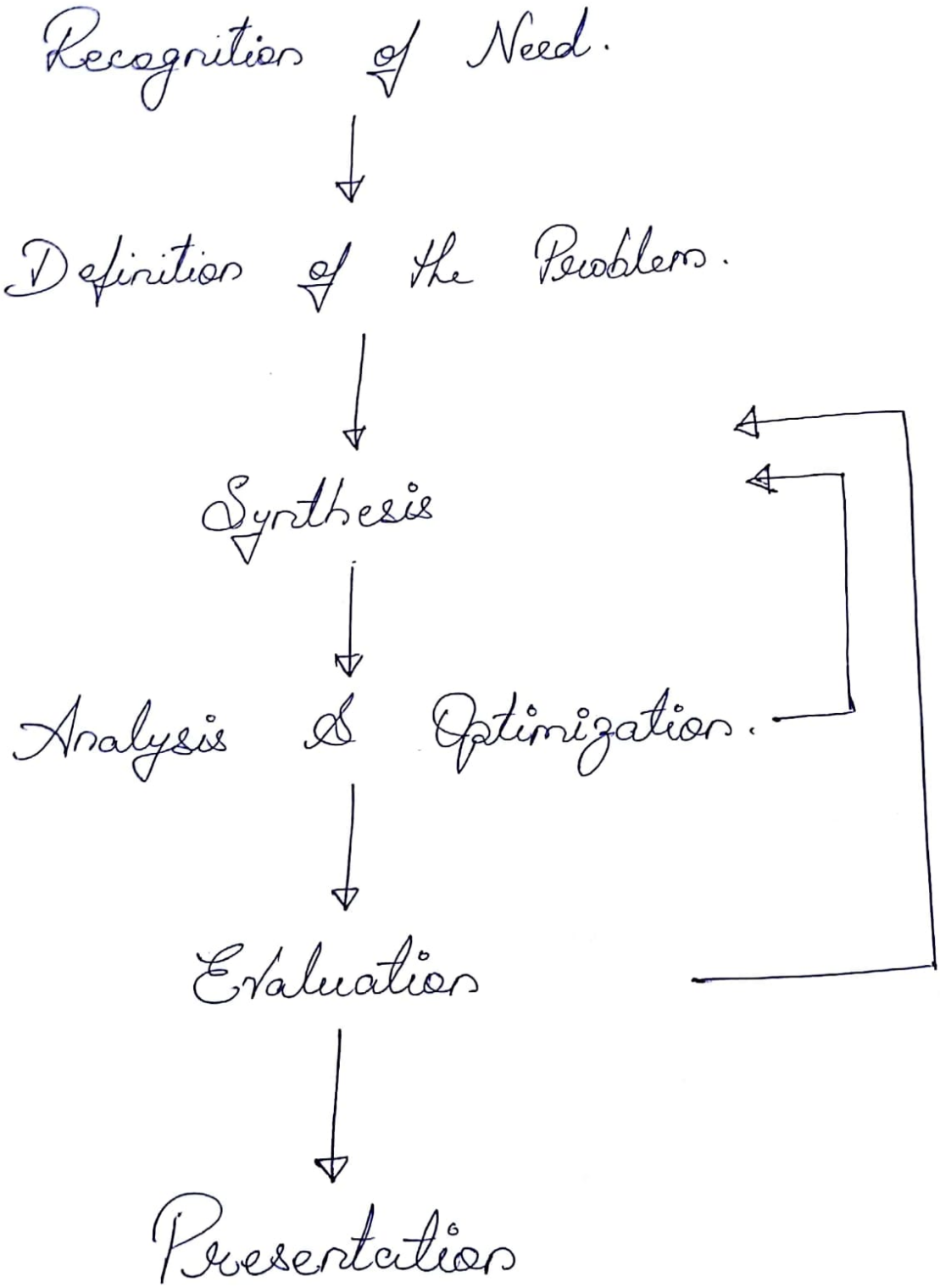
Communicating the design to others is the final and important step in the design process:

- Written
- Oral
- Graphical forms or design report.




## The Design Process

↳ General Design Process as defined by Shigley :



## ↳ Computer Aided Design & Computer Aided Manufacturing :

CAD: can be defined as the application & use of computer systems to assist in the creation, modification, analysis or optimization of a design.

The computer system consists of the hardware & software to perform the specialized design functions required by the particular user. The CAD hardware includes the computer, one or more graphics terminals, keyboard and other peripheral equipments.

CAE: is the process of solving engineering problems with the use of sophisticated, interactive graphical software. It is the use of computer to support engineers in tasks such as analysis, simulation, design, manufacture, planning, diagnosis & repair.

## ↳ Applications of CAD to design process :

1. Geometeric Modelling
2. Engineering Analysis
3. Design Review & Evaluation
4. Automated Drafting
5. Creating the manufacturing database.

## ↳ Mechanical Engineering Applications of CAD:

The various applications of CAD in mechanical engineering are as follows:

1. Two Dimensional Drafting
2. Report and bill of materials generating.
3. Three Dimensional Modelling.
4. Finite Element Analysis
5. Manufacturing.

## ↳ Integration of CAD/CAM:

CAD stands for Computer Aided Design & CAM stands for Computer Aided Manufacturing.

The combined CAD/CAM is the system concerned with the use of computers to perform product designing and manufacturing operations.

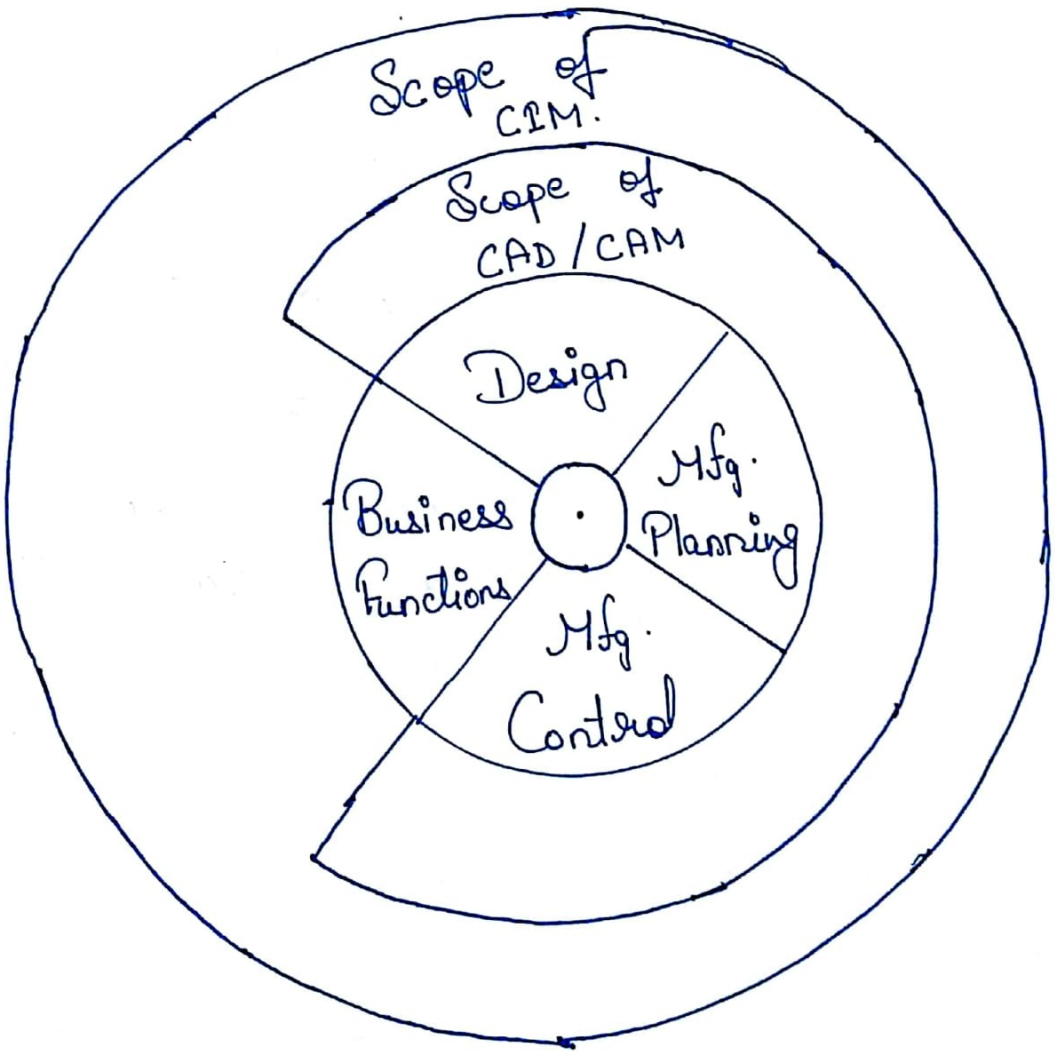
All the manufactured products have to be designed first & they are sent for manufacturi

The important steps involved in an integrated CAD/CAM are as follows:

1. Designing of the product.
2. Generating the drawings
3. Product Planning & Scheduling
4. Manufacturing the product.

↳ Computer Integrated Manufacturing :

CIM includes all of the engineering functions of CAD/CAM including the firm's business functions that are related to manufacturing. The database created in CAD is stored and is used in the generation of manufacturing ~~industries~~ instructions for numerically controlled production process and in the planning of manufacturing operations through Computer Aided Process Planning (CAPP).



↳ CAD Softwares :

1. CATIA : It is a multi-platform CAD/CAM/CAE commercial software. This software is developed by the French company Dassault Systemes. This software is run in the C++ programming language.

2. Pro/Engineer : It is created by Parametric Technology Corporation (PTC). This is a parametric, integrated 3D CAD/CAM/CAE software. This software is based on parameter feature-based, associative solid modelling. It runs on Microsoft Windows & Unix platforms and provides solid modelling, assembly modelling & drafting, finite-elemen analysis & NC & tooling facility for mechanical engineers.

3. Solid Works

4. Solid Edge.

5. Auto CAD.