

# Definition of Machine Design

Machine design is defined as the use of scientific principles, technical information & imagination in the description of a machine or a mechanical system to perform specific functions with maximum economy & efficiency.

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# Basic Requirement of Machine Elements

- ✓ Strength and Rigidity
- ✓ Wear Resistance
- ✓ Minimum Dimensions & Weight
- ✓ Manufacturability
- ✓ Safety
- ✓ Conformance to standards
- ✓ Reliability
- ✓ Maintainability
- ✓ Minimum Life-cycle Cost

# Engineering Materials and their Properties

Selection of proper material for the machine components is one of the most important steps in process of machine design. The best material is one which will serve the desired purpose at minimum costs.

Factors Considered while selecting the material:

- i) Availability: Material should be readily available in market in large enough quantities to meet the requirement.
- ii) Mechanical properties

# Mechanical properties

**Hardness**

**Brittleness**

**Ductility**

**Toughness**

**Strength**

**Elasticity**

**Resilience**

**Plasticity**

**Stiffness**

**Malleability**

# Manufacturing Considerations:

- In some applications machinability of material is an important consideration in selection
- Where the product is of complex shape, castability or ability of the molten metal to flow into intricate passages is the criterion of material selection
- In fabricated assemblies of plates & rods, weldability becomes the governing factor

# Design Considerations

The design of a component or system may be influenced by a number of requirements. If a requirement affects design, it is called a design consideration. For example, if the ability to carry large loads without failure is important, we say that strength is a design consideration. Most product development projects involve a number of design considerations:

- Strength/stress
- Distortion/stiffness
- Wear
- Corrosion
- Safety
- Reliability
- Friction
- Usability/utility
- Cost
- Processing requirements
- Weight
- Life
- Noise
- Aesthetic considerations
- Shape
- Size
- Thermal properties
- Surface finish
- Lubrication
- Marketability
- Maintenance
- Volume
- Liability
- Scrapping/recyclability