1

**Introduction to engineering material science and material science and needs of engineering materials study**

**Materials Science and Engineering**

Sometimes it is useful to subdivide materials science and engineering into:

**Materials Science**

Investigating the relationships between structures and properties of materials

**Materials engineering**

Designing of material to produce set of properties according to required application.

Application

Energy Station

Ship

Airplane

**Needs of engineering materials study**

Why Study Materials Science and Engineering?

All engineers need to know about materials. Innovation in engineering often means the clever use of new material for a specific application .

For **example**:

plastic containers instead of metallic containers.

The engineering disasters are caused by misuse of materials. So it is necessary that the engineer should know how to select materials which best fit the demands of:

* design(التصميمية)
* economic (الاقتصادية
* aesthetic(الجمالية)
* strength(المقاومة)
* durability (متانة).

Beforehand the designer must understand the properties of materials, and their limitations.

Why Study The Mechanical Properties of Metals?

It is necessary to engineer to understand how the measure of various mechanical properties and what represent these properties in order to design components using predetermined materials without occurring deformation and/or failure.

Reasons for studying mechanical properties :

Components made of steel alloys that exposed to external forces must be processed so as to have appropriate mechanical properties (stiffness, strength, ductility, and toughness).

Thus, it is essential to understand significance of these properties, and, development toward acceptable properties values.

The problem is in selecting the right material, several criteria on which the final decision is normally based on:

1) The in – service conditions must be characterized

2) Deterioration of materials properties during service operation, significant reductions in mechanical strength due to exposure to elevated temperature or corrosion environments.

3) Product cost, material may be has ideal properties but expensive

