THERMODYNAMICS studies all aspects of ENERGY and energy transformation (science of energy), and the basic fundamental principles of science and engineering.

Macro-thermodynamics (classical) matter is assumed to be continuum
Micro-thermodynamics (statistical) matter consists of discrete atoms

**SYSTEM**  A region in space or a quantity of matter

<table>
<thead>
<tr>
<th>Open system (control volume)</th>
<th>Closed system (control mass)</th>
<th>Isolated system</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Open system diagram" /></td>
<td><img src="image2" alt="Closed system diagram" /></td>
<td><img src="image3" alt="Isolated system diagram" /></td>
</tr>
</tbody>
</table>

**PROPERTY**  Any characteristic of a system is called a property.

- **Intensive** property mass-independent: \{T, P, \rho, v, u, ...\} (lowercase letters)
- **Extensive** property mass-dependent: \{m, V, U, E, ...\} (upper case letters)
- **Specific** property property per unit mass: \{v = V/m, u = U/m, e = E/m, ...\}
- **Independent** properties \{T, v\}, \{P, v\}, \{T, h\}, ...

**STATE**  Set of all properties of the system defines a state \{T, P, V, m, u, e, v, s, h, ...\}

**EQUILIBRIUM**  Equilibrium is a state of balance. System can remain at equilibrium state indefinitely.

*Thermodynamic equilibrium state:* the system is in equilibrium regarding all possible changes of state; i.e. it maintains thermal, mechanical, phase, chemical etc. equilibria.

**STATE POSTULATE**  The state of a simple compressible system is completely defined by two independent intensive properties

**PROCESS**  Change of a system from one state to another (transformation).

**DIAGRAM**  

- **Quasi-equilibrium process** a system is close to equilibrium at any moment of process
- **Steady-flow process** no change with time
- **Unsteady-flow process** transient
- **Uniform** no change with location
- **Iso-... process** particular property remains constant (isothermal process)