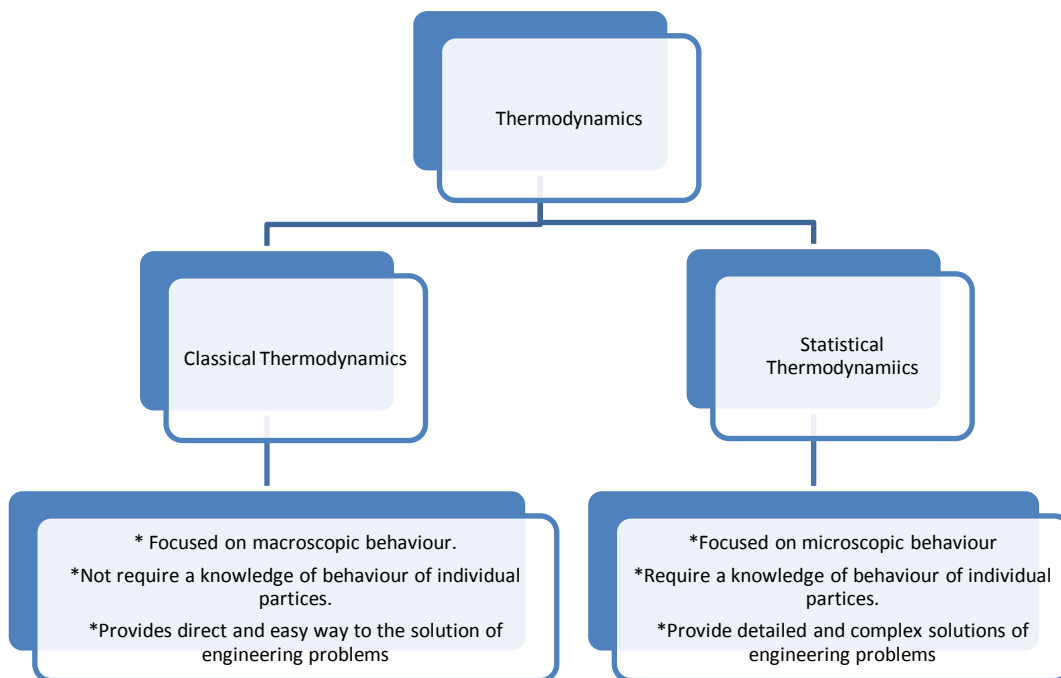


## Basic Concept of Thermodynamics

- ✓ Thermodynamics can be defined as the science of energy.
- ✓ Thermodynamics investigate the all aspects of energy like energy production, transformation, power production, refrigeration and relationship among the properties of matter.
- ✓ 1<sup>st</sup> law of thermodynamics states energy can change from one form to another but the total amount remains constant. Result of this law; Energy cannot be created or destroyed.
- ✓ 2<sup>nd</sup> law of thermodynamics asserts that energy has quality as well as quantity and actual processes occur in the direction of decreasing quality of energy.
- ✓

## Classification of Thermodynamics



## Dimensions and Units

All physical quantities can be described by dimensions. The arbitrary magnitudes assigned to the dimensions are called units.

**Primary dimensions:** Basic dimensions such as time (t), Temperature (T), mass (m) and length (l) called a primary or fundamental dimensions.

**Secondary dimensions:** Dimensions expressed in the term of fundamental dimensions such as velocity (m/s), volume (mxmxm) called secondary dimensions.

Unit Systems: Today, two set of units are stil in common use. Which is SI (Le Systéme International d'unités) and English unit system.

SI unit system based on decimal relationship between various units but English unit system has no numerical base or decimal relationship.

**Table 1: Fundamental Diemnsions and Their Units**

Dimension	SI Unit	English System Unit
Length	Meter	Feet
Mass	Kilogram	Pound
Time	Second	Second
Temperature	Kelvin	Rankine
Electric Current	Ampere	Ampere
Amount of Light	Candela	Candela
Amount of Matter	Mol	Mol

- In English system force is a primary dimensions but in fact and in SI system force is a derived dimension. Force defined as the “force required to accelerate a mass of 1 kg at a rate of  $1 \text{ m/s}^2$ .
- Weight is oftenly incorrectly used to Express mass but weight is a kind of force actually. Weight (w) is the gravitational force applied to the body.

$$W = m * g \quad (1)$$

- If mass change with density for substance this time we discuss about specific weight. Specific weight defined as the weight of a unit volume of substance.

$$W = m * \rho \quad (1)$$

### Difference about mass and weight

- ✓ Mass is constant everywhere
- ✓ Weight change depend on the gravitation.

Work: Work is a form of energy defined as a force times distance. Work is a derived dimension.

$$\text{Work} = \text{Force} \times \text{Distance}$$

Unit of work is kj in SI and btu in English unit system. Btu defiend as amount of energy requiried to raise the temperature of 1 lbm o water at 68 °F to 1 °F. Exact equivalent of Btu in SI system is calorie. Calorie defined as amount of energy needed to raise the temperature of 1 g of water at 15 °C by 1 °C.