RECAP 4.2:
1st law, internal energy, enthalpy and specific heat.

1st law

\[ dU + d(KE) + d(PE) = \Delta Q - \Delta W \]

Time rate basis:

\[ \frac{dE}{dt} = \dot{Q} - \dot{W} \]

Unit mass basis:

\[ u_2 - u_1 = \frac{1}{2}(v_2^2 - v_1^2) + g(z_2 - z_1) = q_{12} - u_{12} \]

Internal energy

\[ u = u(T, \Sigma) \]

Constant volume: 1st law \( \Rightarrow \)

\[ q_{12} = \Delta U \]

Enthalpy

\[ h = u + P\Sigma \]

Most substances:

\[ h = h(T, \Sigma) \]

Constant pressure: 1st law \( \Rightarrow \)

\[ q_{12} = \Delta H \]

Specific heat capacity

\[ c = \frac{1}{m} \frac{\Delta Q}{\Delta T} \]

Isochoric process:

\[ c_v = \left( \frac{\Delta u}{\Delta T} \right)_v \]

Isobaric process:

\[ c_p = \left( \frac{\Delta h}{\Delta T} \right)_p \]