

## FST 110B Lecture 1

- Introductions
- Course Objectives
- Description of Lecture Outline
- Heat content and rate of heat transfer

Heat ... A manifestation of energy.

What is energy?

- Energy flows in various forms: electrical energy and mechanical work
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- Energy is interconvertible with mass

Enthalpy or Heat content:

Heat energy stored in an object.

Internal energy—a result of the activity of atoms

*Heat (or Enthalpy) = mass × specific heat × temperature difference from reference*

### Heat content of an object



Where  $Q$  = enthalpy, kJ  
 $m$  = mass, kg  
 $c_p$  = specific heat  
 $\Delta T$  = temperature difference, °C

### Rate of change of heat content

e.g. in case of a liquid flowing in a pipe, due to heat transfer, its temperature changes from inlet to exit.



Where

$q$  = rate of change of heat content, kJ/s  
 $\dot{m}$  = rate of mass flow, kg/s  
 $c_p$  = specific heat, kJ/kg C  
 $\Delta T$  = temperature difference from inlet to exit, °C