

## DME3051 Mechanical Design

### Summary 1

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#### \*\*\*1.6 Systems of Units\*\*\*

- $g = 9.81 \text{ m/s}^2 = 32.17 \text{ ft/s}^2 = 386 \text{ in/s}^2$
- $1 \text{ N} = 1 \text{ kg}\cdot\text{m/s}^2$
- $1 \text{ in} = 0.0254 \text{ m}$
- $1 \text{ lbm} = 0.454 \text{ kg}$
- $1^\circ\text{F} = 5/9\text{K} =$
- $T_F = (9/5)T_C + 32$
- $T_K = T_C + 273.15$
  
- $1 \text{ hp} = 550 \text{ ft}\cdot\text{lbf/s}$   
 $= (550)(0.3048 \text{ m})(0.454 \text{ kg})(9.8 \text{ m/s}^2)/\text{s}$   
 $= 746 \text{ kg}\cdot\text{m}^2/\text{s}^3$   
 $= 746 \text{ J/s}$
  
- $\text{lbf} = (\text{lbm})(g)$   
 $= (\text{lbm})(32.17 \text{ ft/s}^2)$   
 $= 32.17 \text{ ft}\cdot\text{lbm/s}^2$   
 $= (0.454 \text{ kg})(9.8 \text{ m/s}^2)$   
 $= 4.448 \text{ N}$   
 $= (\text{slug})(\text{ft/s}^2) \quad \leftarrow 1 \text{ slug} = 32.2 \text{ lbm}$   
 $= \text{slug}\cdot\text{ft/s}^2$
  
- Pressure = Stress =  $\text{Pa} = \text{N/m}^2 = \text{kg/m}\cdot\text{s}^2$
- Torque = Energy = Work =  $\text{J} = \text{N}\cdot\text{m} = \text{Pa}\cdot\text{m}^3 = \text{Watt}\cdot\text{s} = \text{kg}\cdot\text{m}^2/\text{s}^2$
- Power =  $\text{W} = \text{J/s} = \text{N}\cdot\text{m/s} = \text{kg}\cdot\text{m}^2/\text{s}^3 = \text{Torque} \times \text{angular velocity}$
  
- Absolute viscosity ( $\mu$ ) [ $\text{N}\cdot\text{s}/\text{m}^2$ ]:  $1 \text{ Poise} = 0.1 \text{ kg/m}\cdot\text{s}$
- Kinematic viscosity ( $\nu$ ) [ $\text{m}^2/\text{s}$ ]:  $1 \text{ Stroke} = 1 \text{ cm}^2/\text{s}$
  
- $\text{ft} = 0.305 \text{ m}$
- $\text{Inch} = 0.0254 \text{ m}$
- $\text{Mile} = 1609 \text{ m}$
- $\text{Yard} = 0.914 \text{ m}$
  
- $1 \text{ US gallon} = 3.785 \text{ liter}$
- $1 \text{ US pint} = 0.473 \text{ liter}$
- $1 \text{ liter} = 10^{-3} \text{ m}^3$