FORCE WEEK
WHAT'S STATICS? (CHAPTER 1.1 - 1.5)

1.1 MECHANICS
- SOLID MECHANICS
- FLUID MECHANICS
- DEFORMABLE BODIES → ME80
- RIGID BODIES
- DYNAMICS → ENGR15
- STATICS → ENGR14

1.2 CONCEPTS
- LENGTH
- TIME
- MASS
- FORCE

METRIC / SI UNITS
- METER m
- SECOND s
- (Kilo) Gram (kg)
- Newton N

IDEALIZATIONS
- "PARTICLE"... HAS MASS BUT NO SIZE
- "RIGID BODY"... GROUP OF PARTICLES WITH A FIXED DISTANCE
- "CONCENTRATED FORCE"... REPRESENTATION OF LOADING (OVER A SMALL AREA) AS A SINGLE FORCE

NEWTON'S THREE LAWS OF MOTION

1. A PARTICLE moving at a constant velocity (SPECIAL CASE: REST WITH NO VELOCITY), \( v = \text{const} \), REMAINS IN THIS STATE UNLESS \( F \neq 0 \)
A particle of mass \( m \) subject to a force \( \vec{F} \) experiences an acceleration along the line of \( \vec{F} \) such that

\[ \text{"Accelerated motion"} \quad \frac{\vec{F}}{m} = \vec{a} \]

\[ \vec{a} = \frac{\vec{F}}{m} \]

Mutual forces of action and reaction are equal, opposite, and collinear

\[ \text{"Action = Reaction"} \quad \vec{F}_{AB} = -\vec{F}_{BA} \]

Weight ("conversion of mass into force")

\[ W = m \cdot g \]

\[ w = \text{weight} \]

\[ m = \text{mass} \]

\[ g = 9.81 \text{ m/s}^2 \]

\[ g \] acceleration due to gravity

The body of a mass of \( m = 1 \text{ kg} \) has a weight of \( W = 1 \text{ kg} \cdot 9.81 \text{ m/s}^2 = 9.81 \text{ N} \)

1.3/1.4 SI system of units

<table>
<thead>
<tr>
<th>CONVERSION</th>
<th>FPS</th>
<th>SI</th>
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</thead>
<tbody>
<tr>
<td>FORCE</td>
<td>lbf</td>
<td>1.448N</td>
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<tr>
<td>MASS</td>
<td>slug</td>
<td>14.59 kg</td>
</tr>
<tr>
<td>LENGTH</td>
<td>ft</td>
<td>0.305 m</td>
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