Phase Transformation in Metals

MSE-S304

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Stability and Equilibrium

- **The majority of the concepts of thermodynamics are based on stable equilibrium theories.**

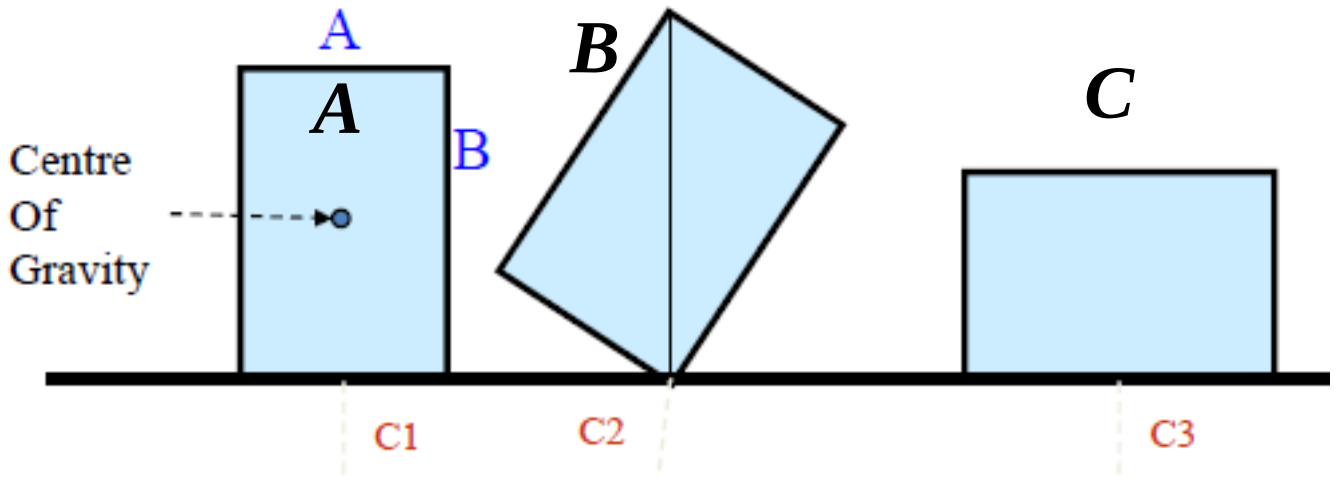
- **A system is said to be in stable equilibrium, if system returns to its original position when the external force has been taken away.**

- ***Equilibrium refers to a state:*** ***Balance of Forces*** **(Equilibrium points have *zero slope* in a energy-parameter plot)**

Stability and Equilibrium

Simple Mechanical system: ***Rectangular Block on a plane***

(System is under an uniform gravitational potential)



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Stability and Equilibrium

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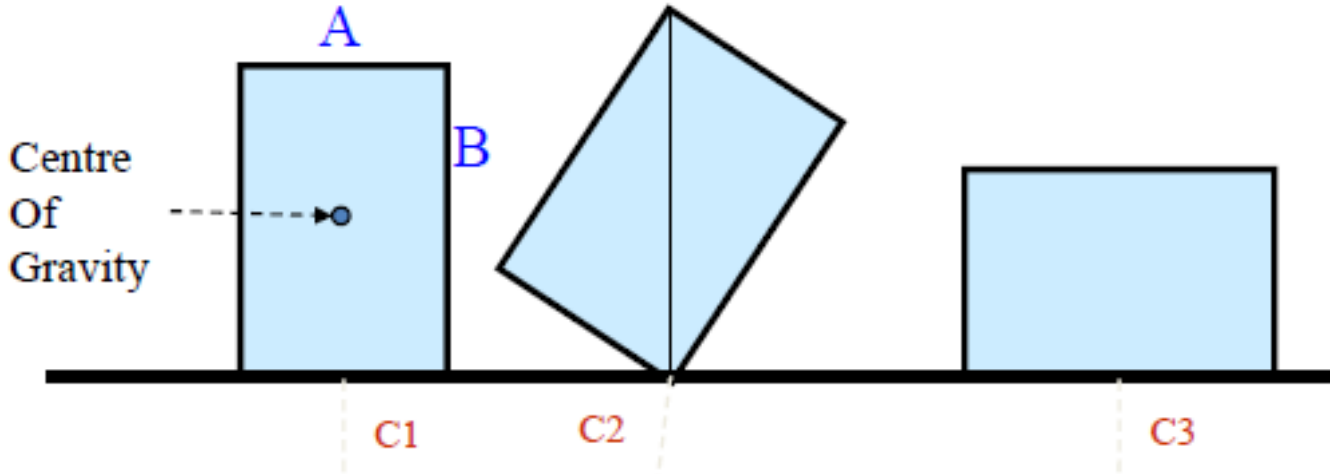
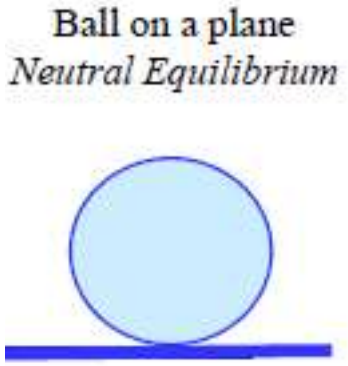


- ***State of neutral equilibrium:* Ball on a plane**



- **The system is in a *constant energy state* with respect to configurations**

Stability and Equilibrium

- ***Stability relates to perturbations:*** ***Small perturbations***

(Stability relates to the curvature at the equilibrium points)

- ***Potential energy (PE):*** ***Height of centre of gravity (CG).***

(PE of the system depends on the height of the CG).

Stability and Equilibrium

➢ *Three kinds of equilibrium (with respect to energy)*

- *STABLE STATE (Global minimum)*
- *METASTABLE STATE (Local minimum)*
- *UNSTABLE STATE (Maximum)*