Theory of Machines and Vibrations

University Mechanical Engineering · Vocabulary in context

Word	Example
theory of machines	**Theory of machines** studies how mechanisms move and carry forces.
vibration	Unbalance makes the pump's **vibration** worse at speed.
mechanism /ˈmekənɪzəm/	A slider-crank is the **mechanism** inside the dosing pump.
links	The slider-crank has four **links**, counting the ground.
kinematic pairs	Pins and slides are lower **kinematic pairs**.
degrees of freedom /dɪˈgriːz ɒv ˈfriːdəm/	A mechanism with one **degree of freedom** needs one motor.
Gruebler's equation	**Gruebler's equation** counts the degrees of freedom.
Grashof condition	The **Grashof condition** says whether a link can turn fully.
inversions	Grounding a different link gives the **inversions** of a chain.
velocity polygon	The **velocity polygon** closes with the piston velocity.
acceleration polygon	The **acceleration polygon** adds centripetal and tangential parts.
instant centre	At the **instant centre**, instantaneous velocity is zero.

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Coriolis component	A slider on a rotating arm has a **Coriolis component**.
static balance	**Static balance** removes the net rotating force.
dynamic balance	**Dynamic balance** also removes the rocking couple.
two planes	Correct the rotor in **two planes** to remove force and couple.
reciprocating mass	The piston is a **reciprocating mass**.
primary force	The **primary force** varies once per turn.
secondary force	The **secondary force** varies twice per turn.
natural frequency /ˈnætʃərəl ˈfriːkwənsi/	A swing has its own **natural frequency**.
damping ratio	A **damping ratio** of 1 gives critical damping. $\zeta = 1$
underdamped	**Underdamped** responses ring at the damped frequency.
logarithmic decrement	The **logarithmic decrement** comes from two successive peaks.
phase plane	In the **phase plane** a damped motion spirals inwards.
resonance /ˈrezənəns/	**Resonance** makes the swing go very high.
transmissibility	A **transmissibility** of 0.136 passes 14% of the force. $T = 0.136$ 14%
vibration isolation	**Vibration isolation** needs a low natural frequency.

Word	Example
eigenvalue problem	The natural frequencies come from an **eigenvalue problem**.
mode shape	Each natural frequency has its own **mode shape**.
mode superposition	**Mode superposition** turns coupled equations into single ones.

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