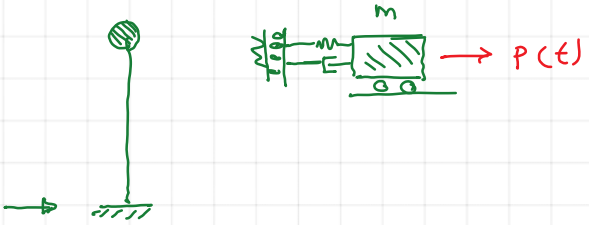
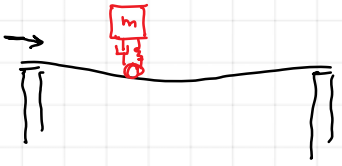
Structural dynamics is the study of the behavior of structures under dynamic loads, such as earthquakes. Understanding the dynamics of structures is crucial in assessing the safety and performance of buildings and other structures. It involves analyzing how the structures respond to different loads and how they affect their stability and integrity. Engineers use various tools and techniques to model and simulate the behavior of structures under dynamic loads, which helps them design safer and more resilient structures that can withstand extreme conditions.

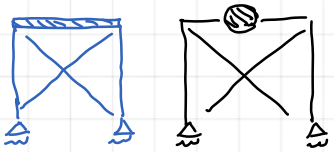
The video series is structured to initially cover fundamental topics, allowing beginners to grasp the basics. As the series progresses, it delves into more intricate and practical examples, catering to the needs of intermediate and advanced learners. By following the series from start to finish, viewers can expect to gain a comprehensive understanding of the subject matter.

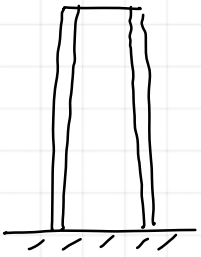
The first video is an introduction that covers basic subjects.

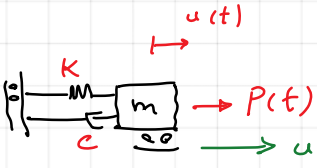


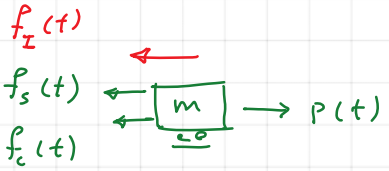




SDF








$$\Sigma F = m \cdot a \Rightarrow -f_s(t) - f_c(t) + p(t) = m \cdot a$$

$$-m \cdot a - f_s(t) - f_c(t) + p(t) = 0$$

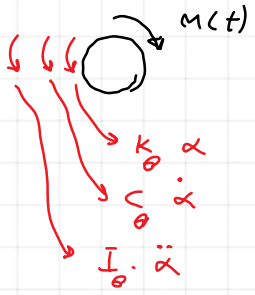
$u(t)$ = Displacement $\quad f_s = k\,u(t)$

$\dot{u}(t)$ = velocity $\quad f_c = c \cdot u(t)$

$\ddot{u}(t)$ = Acceleration $\quad f_I = m\,\ddot{u}(t)$

$$-m\ddot{u}(t) - ku(t) - c\dot{u}(t) + p(t) = 0$$

$$\boxed{m\ddot{u}(t) + c \cdot u(t) + ku(t) = p(t)}$$




$\Sigma M = \bar{I} \cdot \ddot{\alpha}$

$I_\theta \ddot{\alpha} + c_\theta \alpha + k_\theta \alpha = M(t)$

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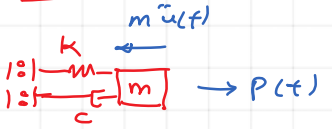
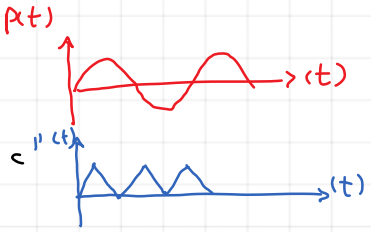
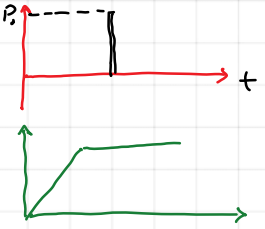



P(t): → { Periodic → { harmonic, non-harmonic } ; non-periodic }

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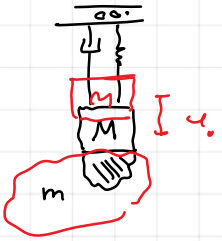
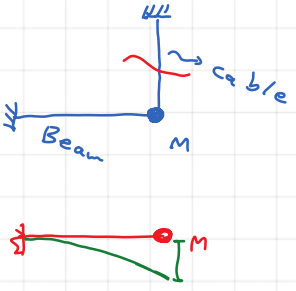
$m\ddot{u}(t) + c\dot{u}(t) + ku(t) = p(t)$




$p(t) = 0 \Rightarrow$

$p(t) = 0$ → Free vibration →
- → undamped ($c = 0$) → SDF (undamped) → $(m\ddot{u} + ku = 0)$
- → Damped ($c \neq 0$) → SDF (Damped) → $m\ddot{u} + cu + ku = 0$

$p(t) \neq 0$ → Forced vibration →
- $c = 0$ → $m\ddot{u} + ku = p(t)$
- $c \neq 0$ → $mu + cu + ku = p(t)$