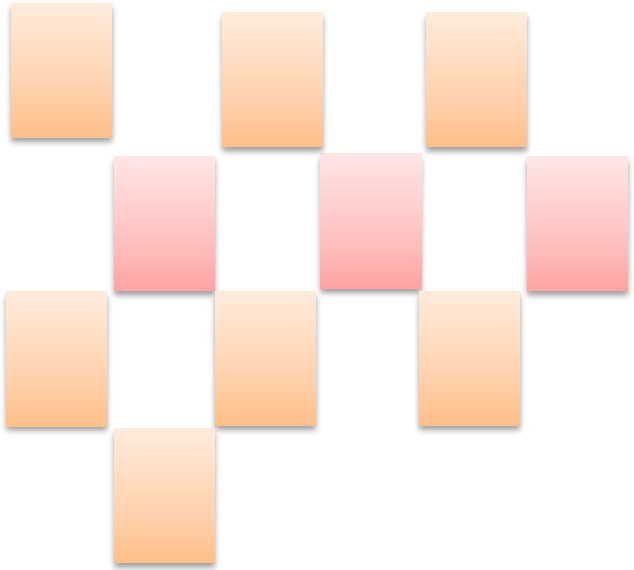


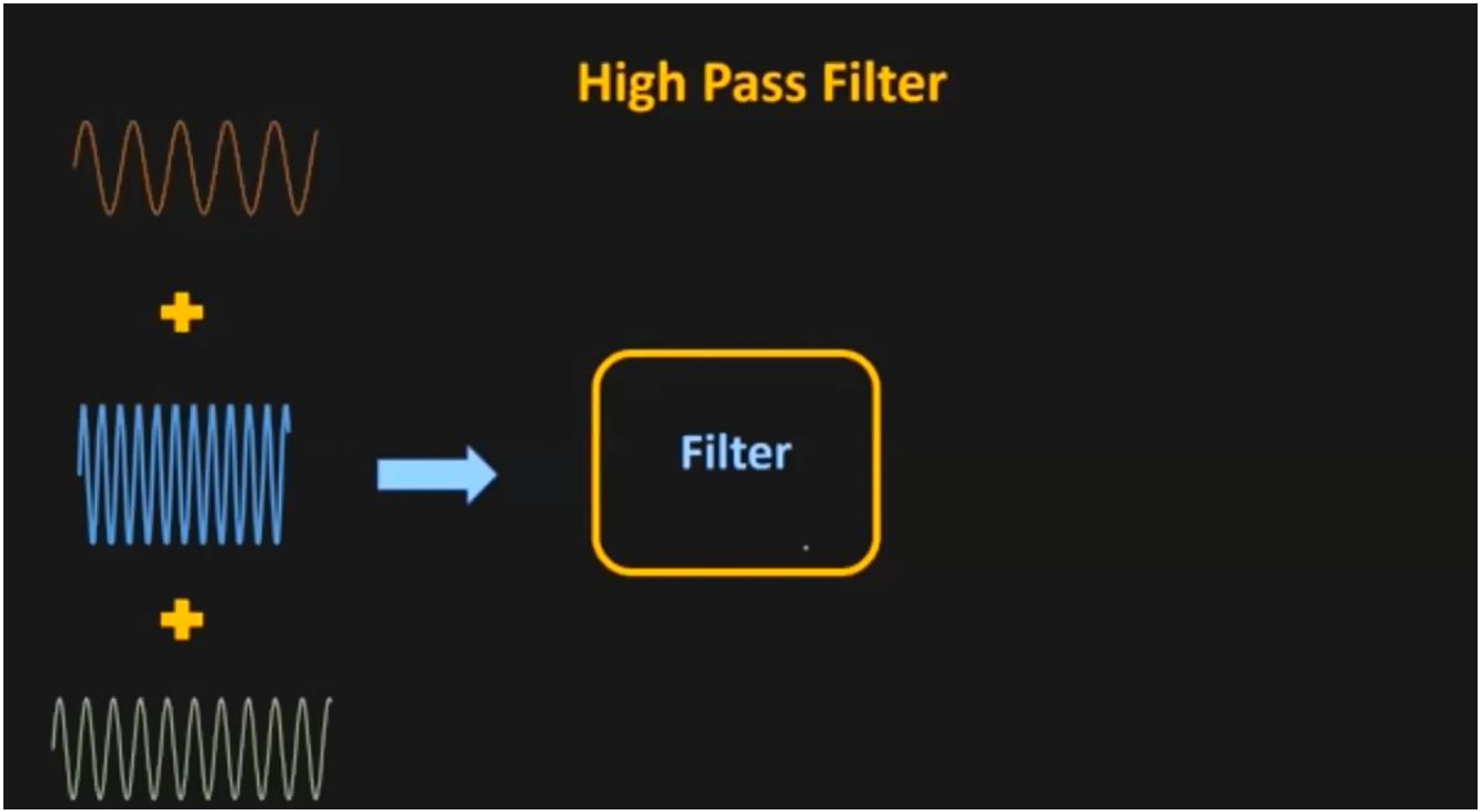
دانشگاه فنی حرفه ایی انقلاب اسلامی
دانشکده مهندسی برق

آموزش مجازی درس
مدارهای جریان متناوب

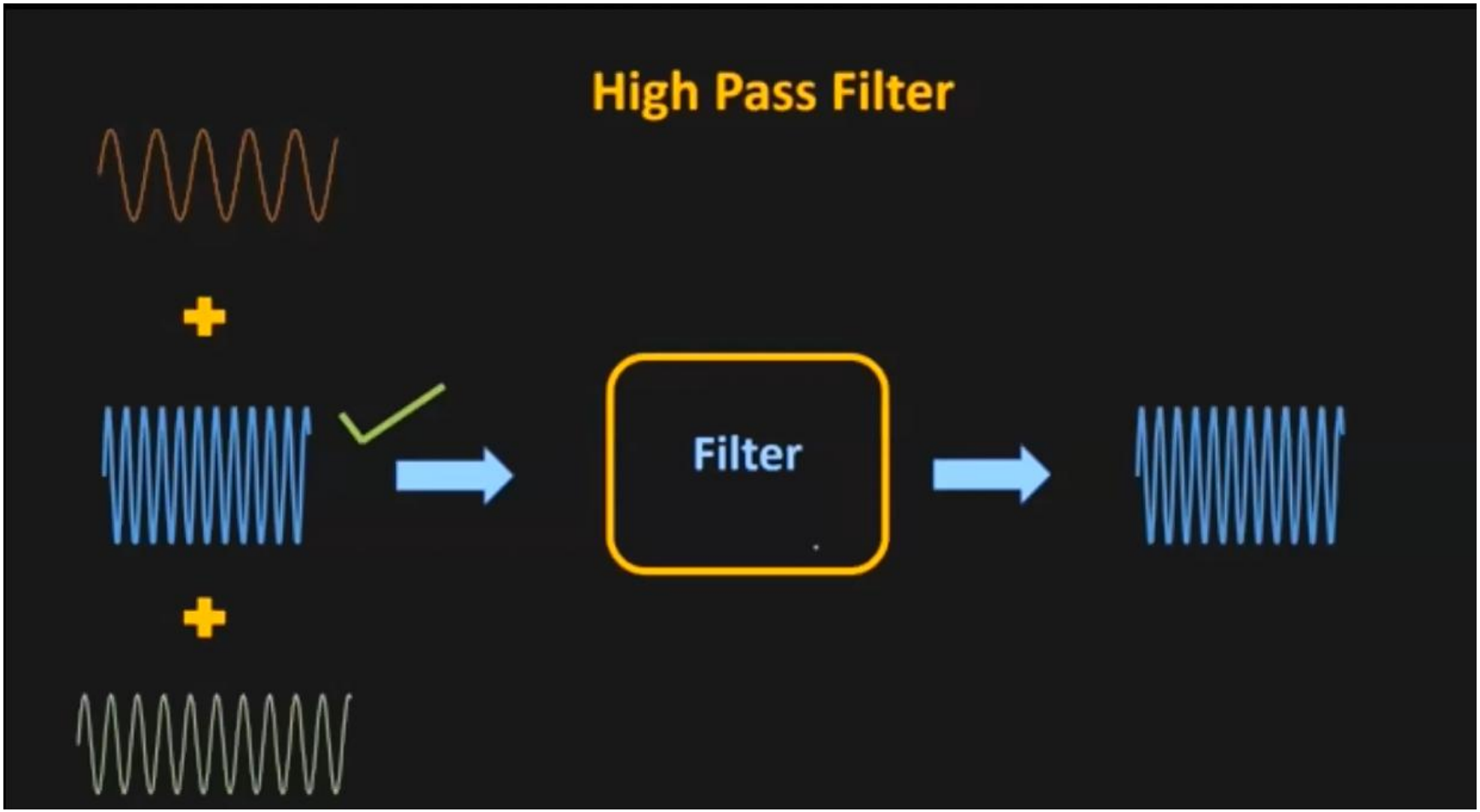
جلسه سوم

ارائه دهنده: دکتر علیرضا ناطقی

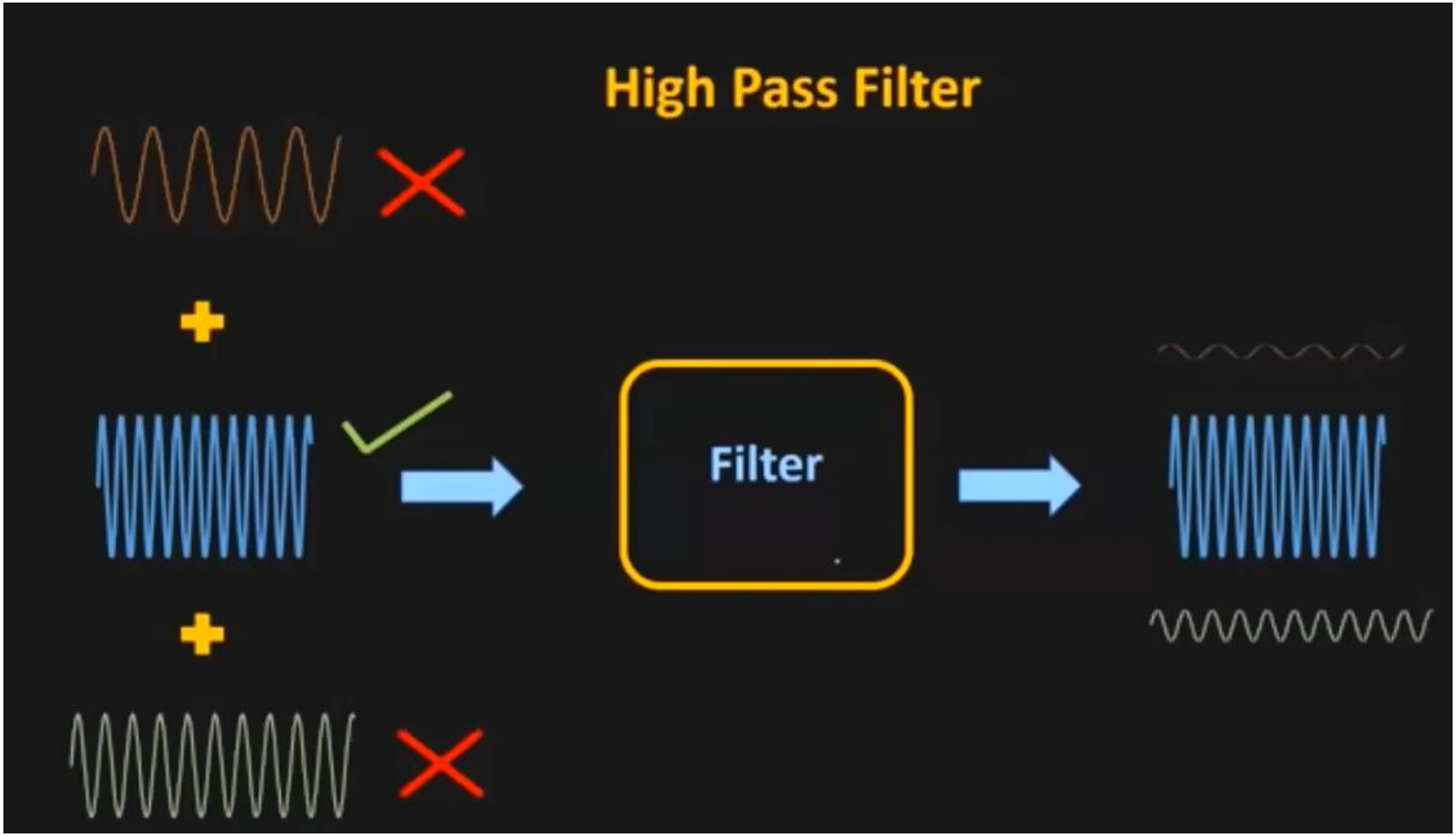
فیلترهای RC بالا گذر



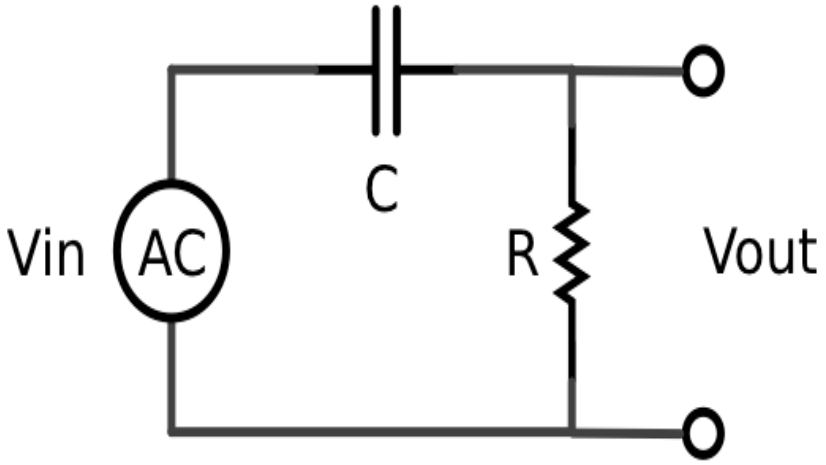
فیلترهای RC بالا گذر



فیلترهای RC بالا گذر



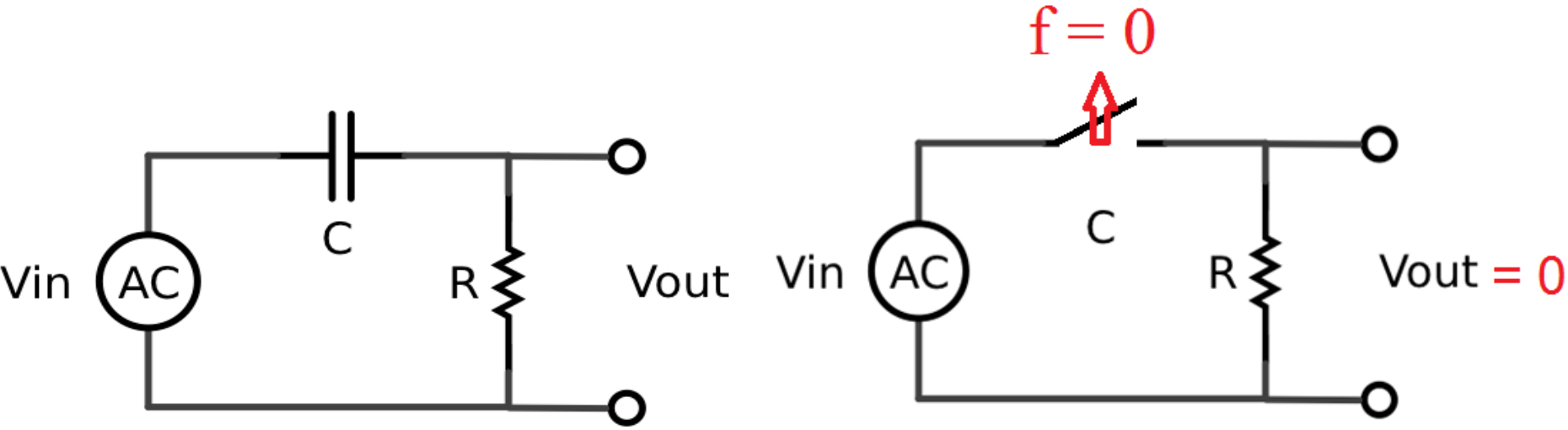
فیلترهای RC بالا گذر



$$Vout = \left(\frac{R}{R + Zc}\right) V_{in} = \left(\frac{R}{R + (-jXc)}\right)$$

$$|Vout| = \left(\frac{R}{\sqrt{R^2 + X_c{}^2}}\right) |V_{in}|$$

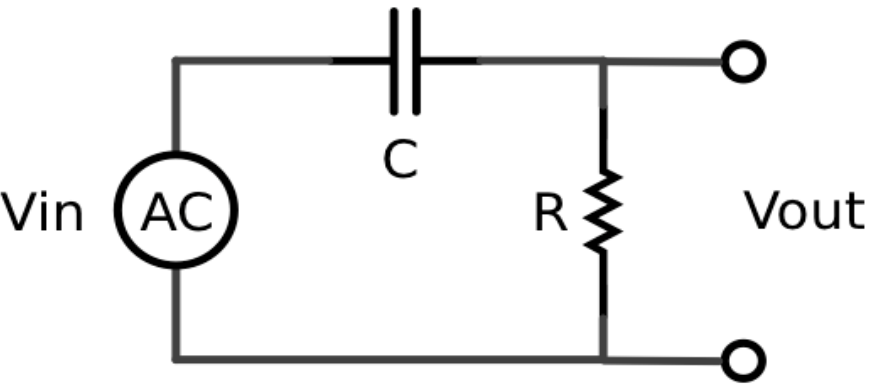
فیلترهای RC بالا گذر

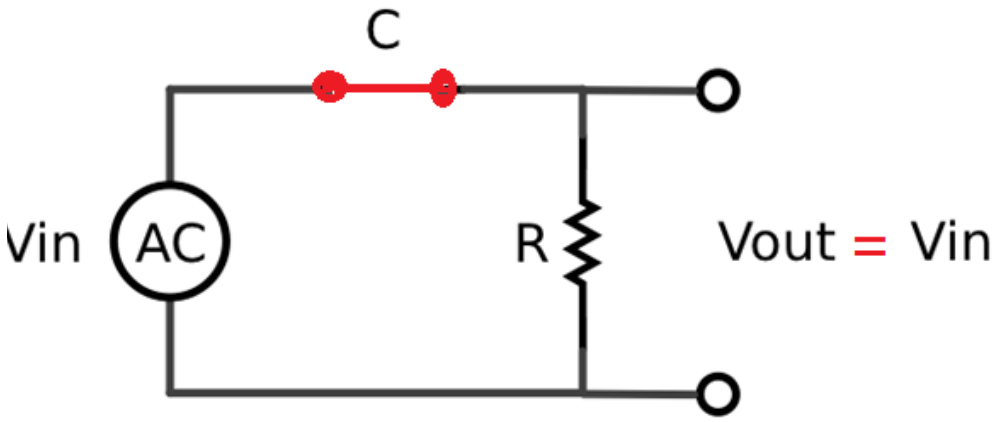


$$|Vout| = \left(\frac{R}{\sqrt{R^2 + X_c{}^2}} \right) |V_{in}|$$

$$f = 0 \rightarrow \omega = 0 \rightarrow (X_c) = \left(\frac{1}{\omega c} \right) = \infty \rightarrow |Vout| = 0$$

فیلترهای RC بالا گذر

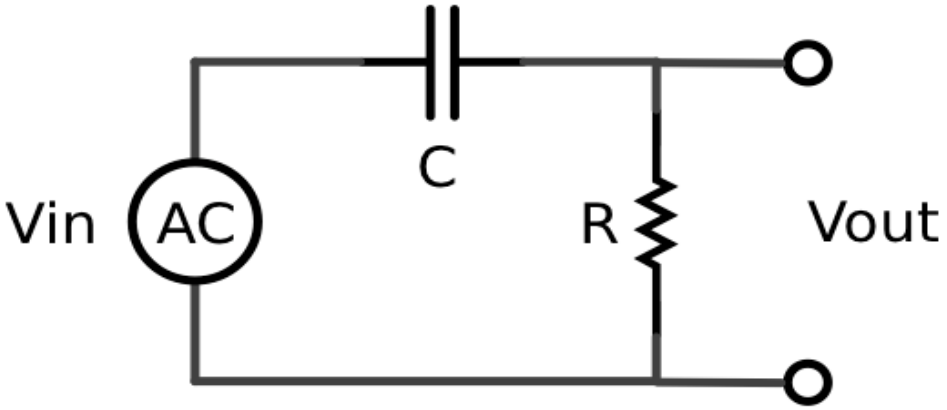




$$|Vout| = \left(\frac{R}{\sqrt{R^2 + {X_c}^2}} \right) |V_{in}|$$

$$f = \infty \rightarrow \omega = \infty \rightarrow (X_c) = \left(\frac{1}{\omega c} \right) = 0 \rightarrow |Vout| = |V_{in}|$$

محاسبه فرکانس قطع فیلتر



$$|Vout| = \left(\frac{R}{\sqrt{R^2 + {X_c}^2}} \right) |V_{in}|$$

$$\text{if} : R = (X_c) \rightarrow |Vout| = \left(\frac{R}{\sqrt{R^2 + R^2}} \right) |V_{in}| = \frac{1}{\sqrt{2}} |V_{in}| = 0.707 \, |V_{in}|$$

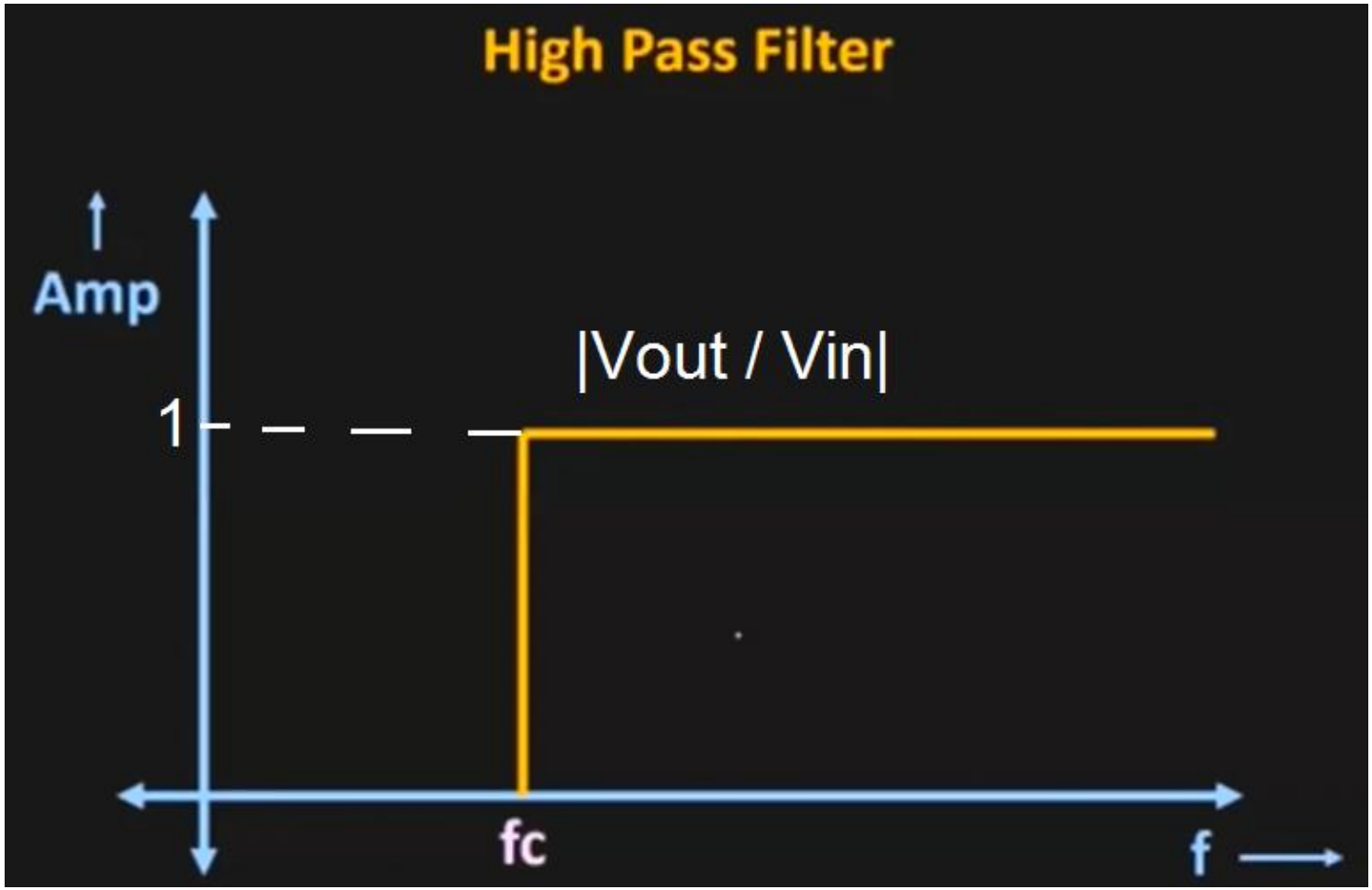
محاسبه فرکانس قطع فیلتر

$$|Vout| = \left(\frac{R}{\sqrt{R^2 + {X_c}^2}} \right) |V_{in}|$$

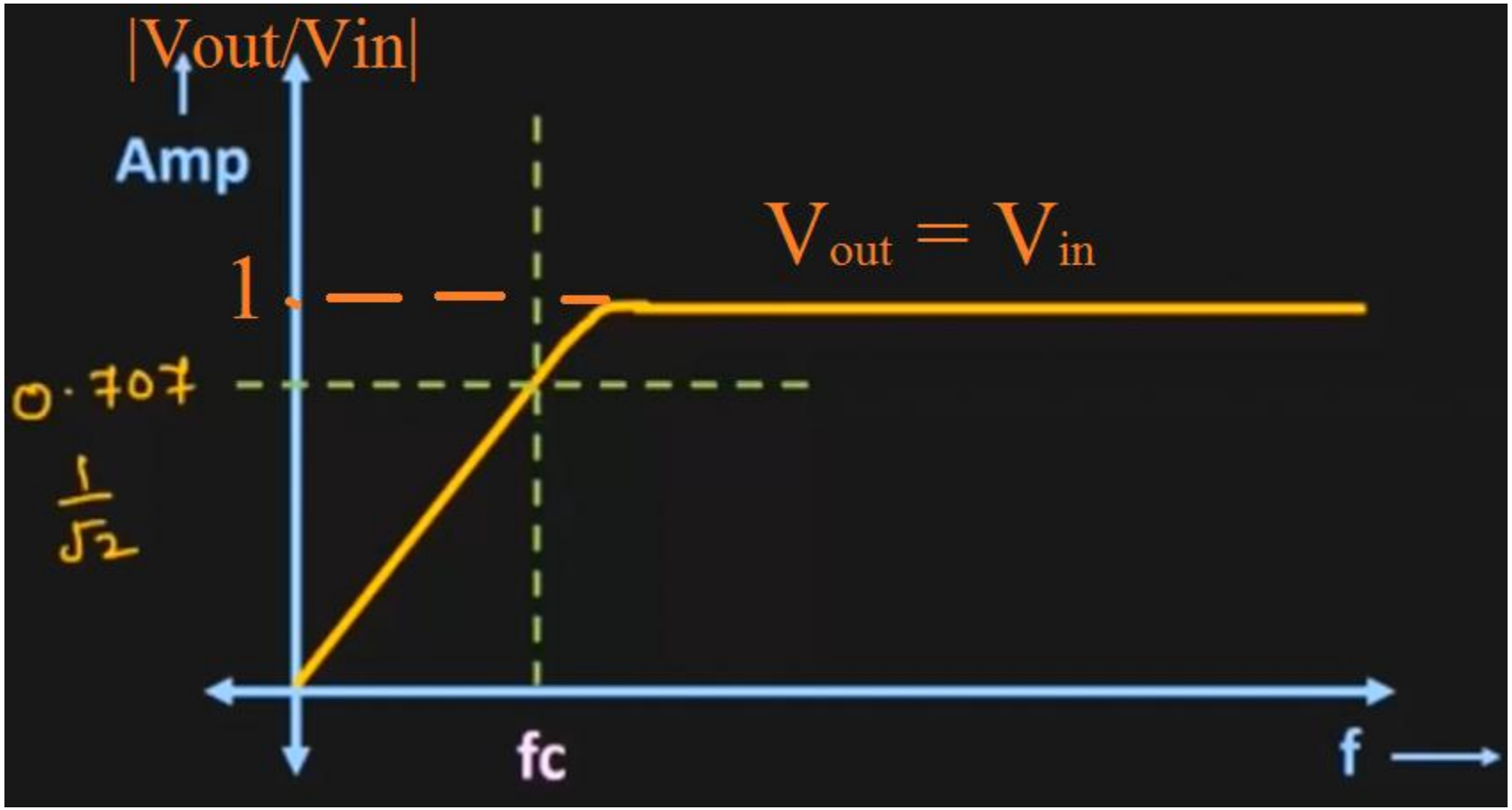
$$\text{if}: R = (X_c) \rightarrow |Vout| = \left(\frac{R}{\sqrt{R^2 + R^2}} \right) |V_{in}| = \frac{1}{\sqrt{2}} |V_{in}| = 0.707 \, |V_{in}|$$

$$R = (X_c) \rightarrow R = \left(\frac{1}{2\pi f_c C} \right) \rightarrow f_c = \frac{1}{2\pi R c}$$

محاسبه فرکانس قطع فیلتر



محاسبه فرکانس قطع فیلتر



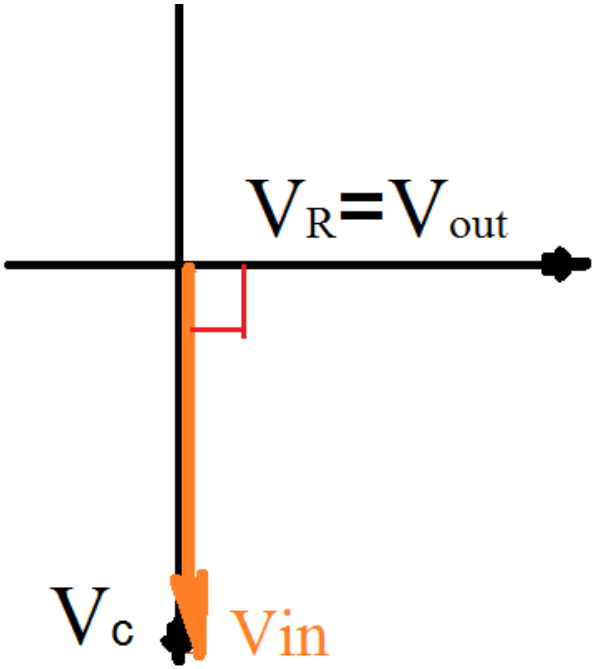
$$Vout = \left(\frac{R}{R + Zc}\right) V_{in} = \left(\frac{R}{R + (-jXc)}\right)$$

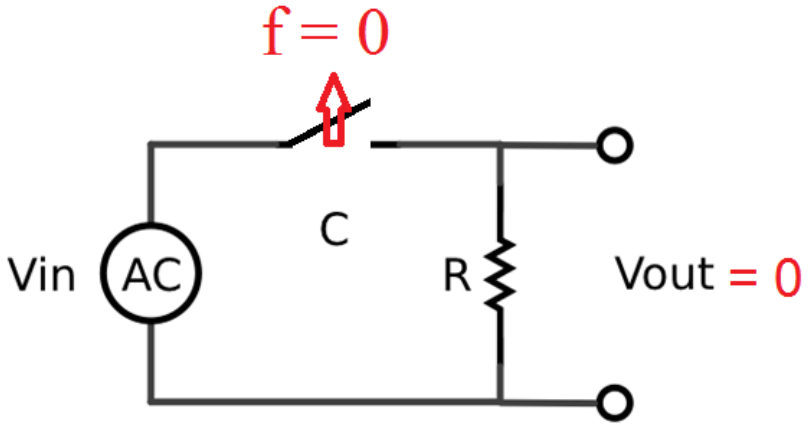
$$Vout = \left(\frac{R}{R + (-j(\frac{1}{C\omega}))}\right) Vin = \left(\frac{1}{1 + (-j(\frac{1}{RC\omega}))}\right) Vin$$

$$|Vout| = \left(\frac{1}{\sqrt{1 + \frac{1}{(RC\omega)^2}}}\right) |V_{in}|$$

$$\measuredangle V_{out} = \left(Arctg\left(\frac{1}{RC\omega}\right)\right) + \measuredangle V_{in}$$

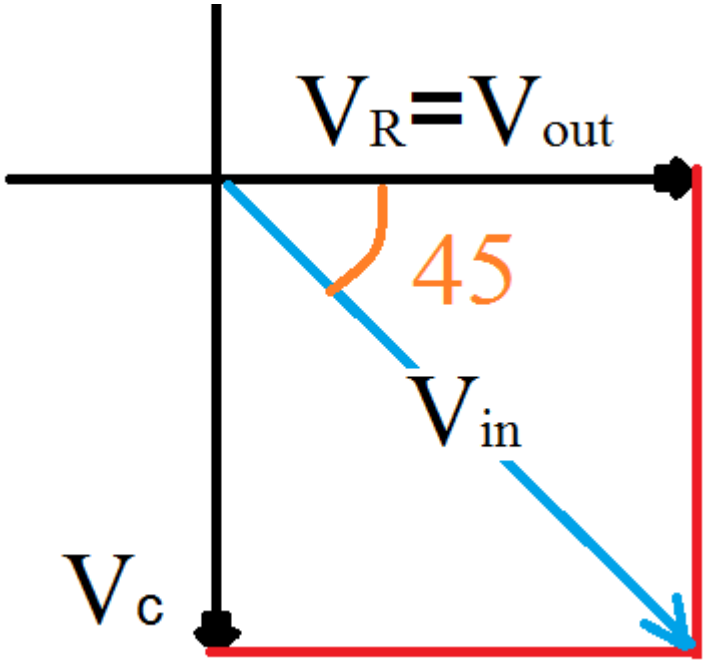
$$f = 0 \rightarrow \quad V_{out} = V_R = 0 \rightarrow V_c = Vin$$

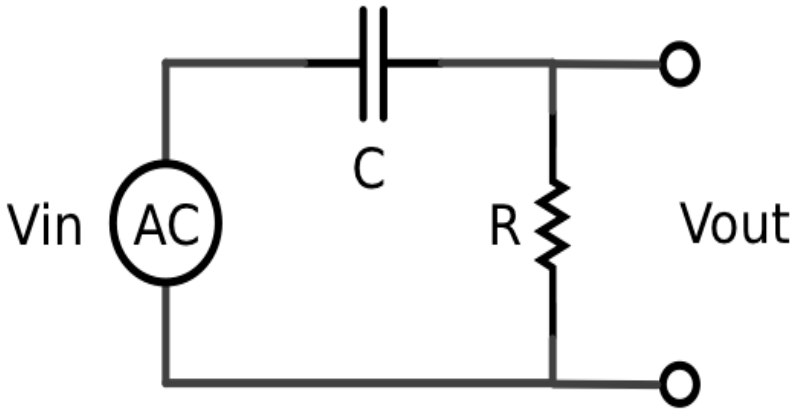




$$\measuredangle V_{out} = \left(Arctg\left(\frac{1}{RC\omega}\right)\right) + \measuredangle V_{in}$$

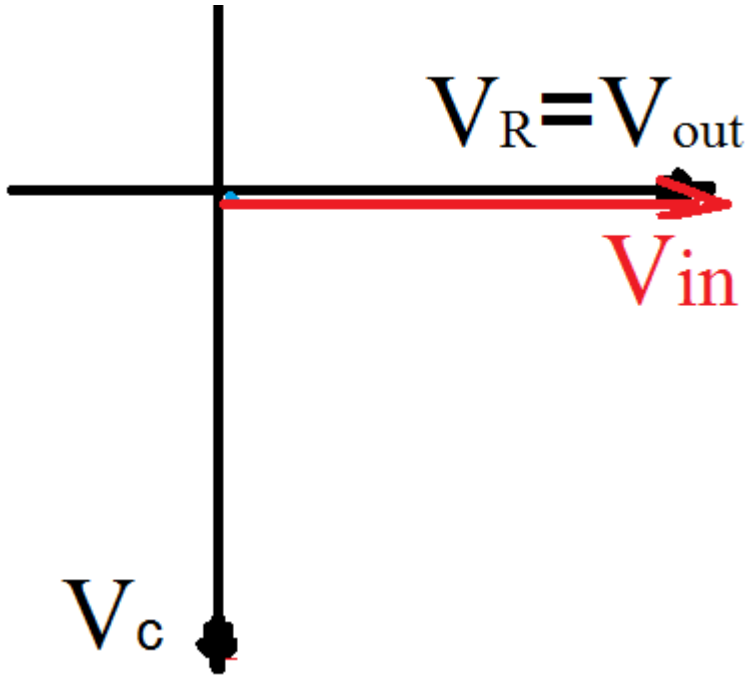
$$if: R = (X_c) \rightarrow |V_R| = |Vc|$$

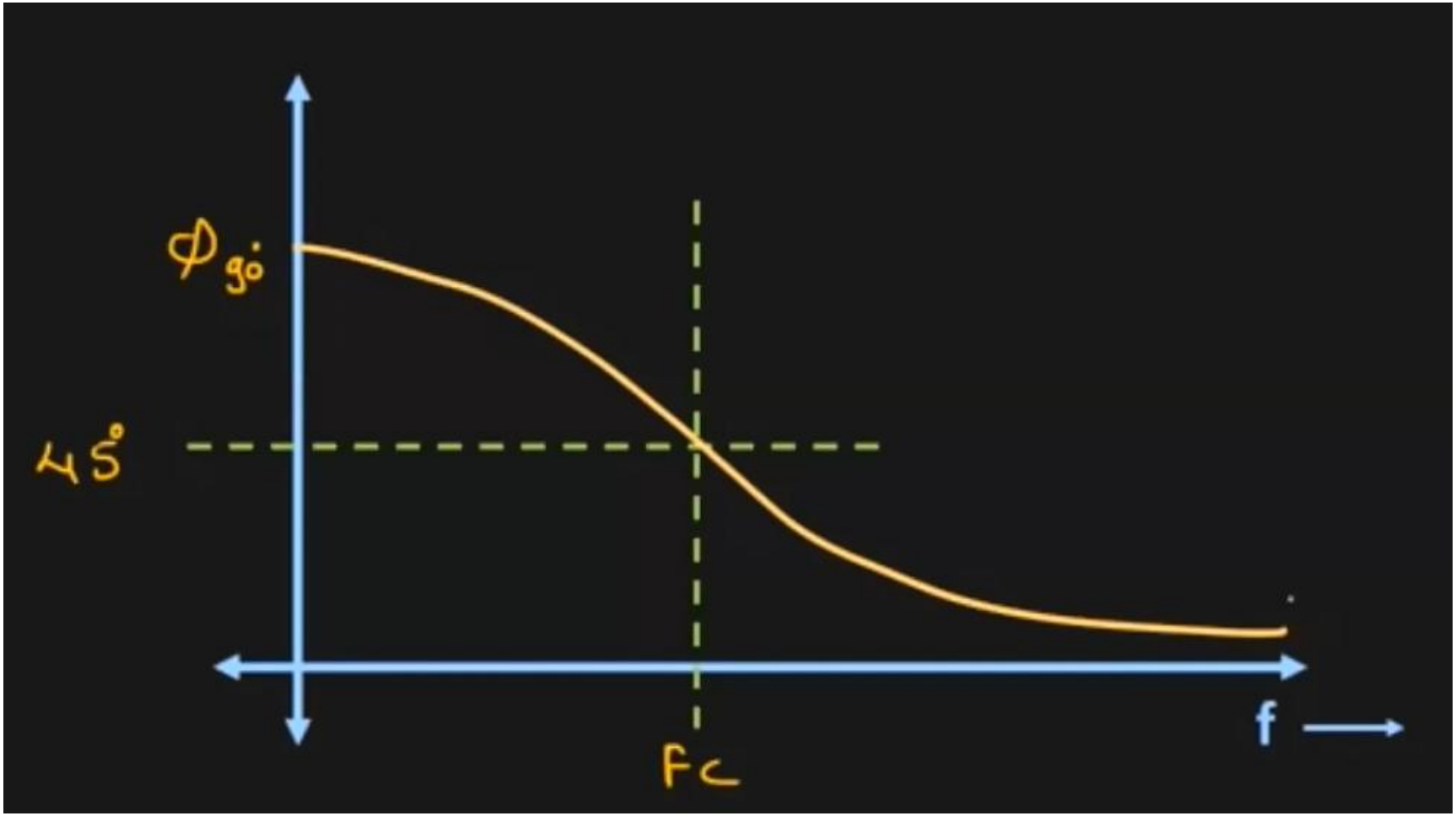




$$\sphericalangle V_{out} = \left(Arctg\left(\frac{1}{RC\omega}\right)\right) + \sphericalangle V_{in}$$

$$f = \infty \;\rightarrow\; V_{out} = V_R = V_{in}$$




ϕ_{90°
45°
Fc
f