Introduction:

Students taking this course must be able to perform the

- **mesh**
- **loop**
- **nodal**

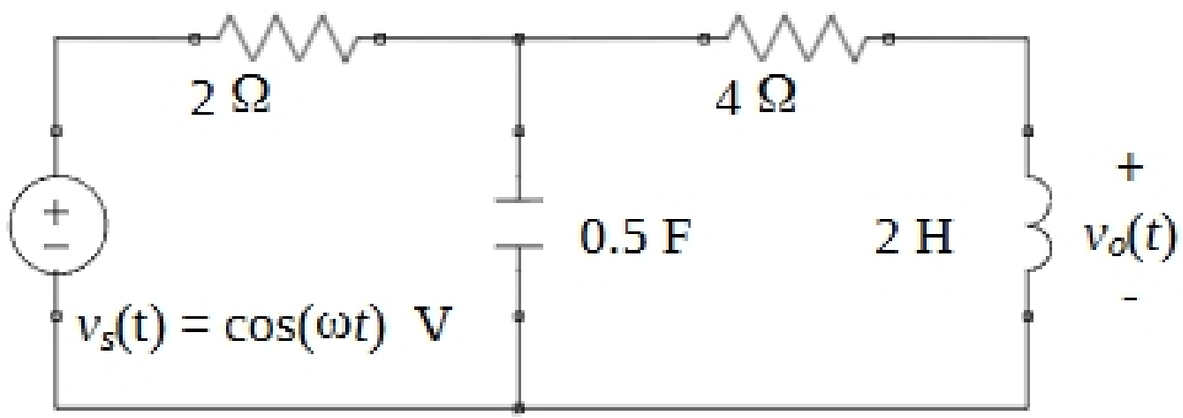
methods for DC and AC steady-state circuit analysis on circuits containing

- **Resistors, Capacitors, Inductors**
- **Op Amps**
- **Ideal Transformers**
- **Mutual Inductance**
- **Independent Voltage and Current Sources**
- **Dependent Voltage and Current Sources**

Students must be able to load these circuits into SPICE and determine the currents and voltages throughout the circuit.

Node Voltage Example:

Perform phasor analysis to determine $\hat{V}_o$. Since the frequency of the source is not specified, leave impedances in terms of $j\omega = p$.

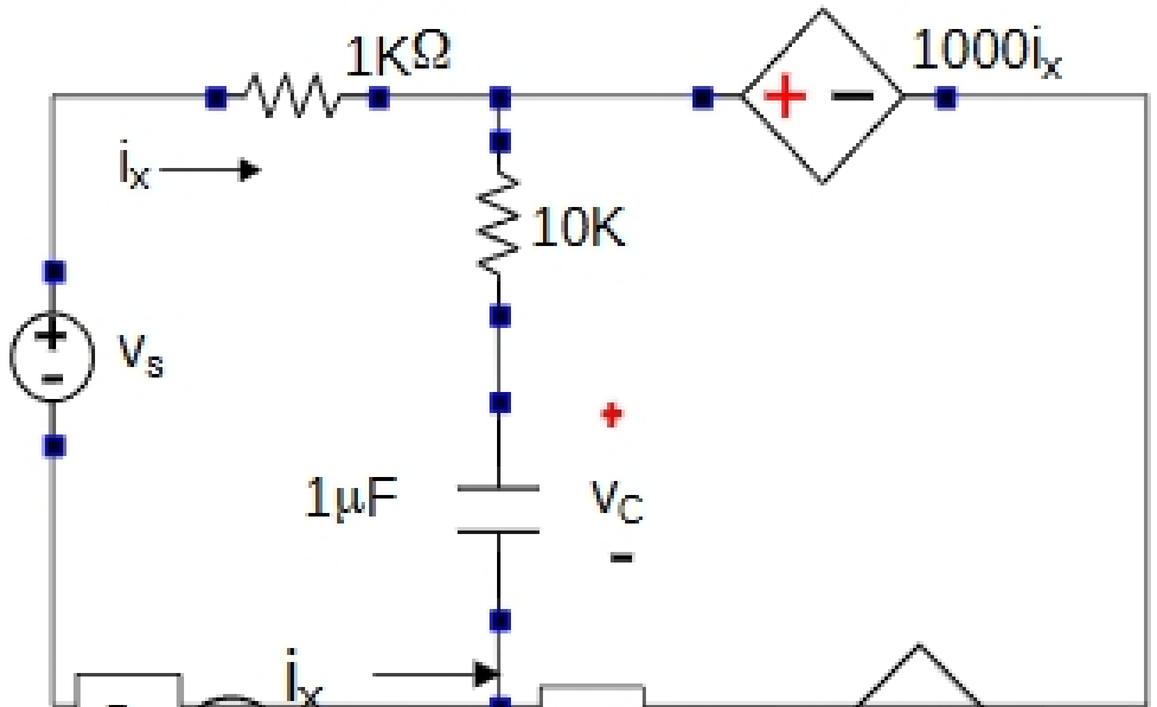


Show that $\hat{V}_o = \hat{V}_s \frac{p}{p^2 + 3p + 3} = \hat{V}_s \frac{\sqrt{\omega^2}}{\sqrt{(3 - \omega^2)^2 + 9\omega^2}} \angle 90° - \tan^{-1}\left(\frac{3\omega}{3 - \omega^2}\right)$

Show $v_0(t)$ = .33cos(2t-9.46ω) V , when ω=2

Mesh Current Example:

Perform phasor analysis to determine $\hat{V}_C$. Assume $v_s(t) = 5\cos(2\pi 60t)$ v. Write a SPICE program to also find this value.



Show that $\hat{V}_C = \frac{0.5}{\sqrt{(.01\omega)^2 + 1^2}} \angle \left(-\tan^{-1}\left(\frac{.01\omega}{1}\right) \right)$

Show $v_c(t) = 0.6410\cos(\omega t - 75.1439°)$ v , when $\omega = 2\pi 60$