Minimal requirement for the course EE-511

1- Electrical circuits
   a. Be able to solve an electrical circuit with
      i. Kirchhoff's law, nodal and mesh analysis
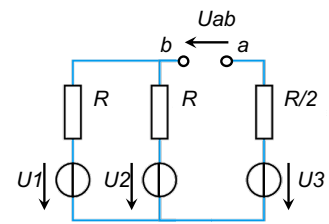   ii. Thevenin's theorem and Norton's theorem
      iii. Superposition

Figure 1

For example in figure 1, you should be able to show with each rule i, ii or iii, that:
$$U_{ab} = U_3 - \frac{U_1 + U_2}{2}$$

   b. Be able to solve bridge circuit such as Wheatstone bridge
   For example be able to determine $u_o = \frac{R_2 R_3 - R_1 R_4}{(R_1+R_2)\cdot(R_3+R_4)} u$ in the circuit of figure 2.

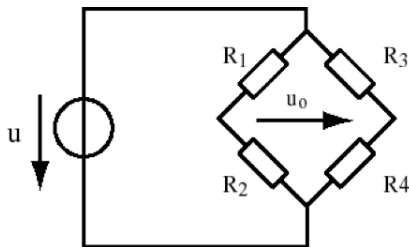

Figure 2   Figure 3
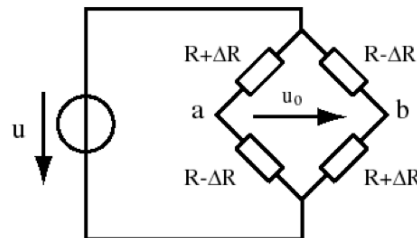
Or full bridge of figure 3 as $u_o = -\frac{\Delta R}{R} u$.

Or in quarter bridge $|u_0| = \frac{\Delta R}{4R} u$, half bridge $|u_0| = \frac{\Delta R}{2R} u$

   c. Be able to solve circuit with operational amplifiers
      i. Non-inverting amplifier
      ii. Inverting amplifier
      iii. Unity-gain buffer amplifier
      iv. Differential amplifier
      v. Summing amplifier
      vi. Other basic circuit with amplifier
   For example you should be able to find the gain (G) of the circuit of figure 4:

$$G = 1 + \frac{50k\Omega}{R_G}$$

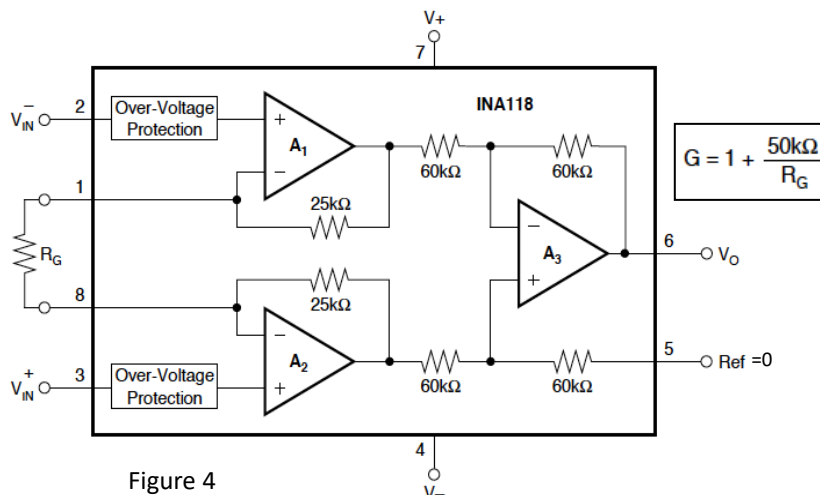Figure 4

2) Static and dynamic characteristics of systems
    - zero, first and second order system
    - Laplace transformation
    - Transfer function determination
    - resonant frequency, damping
    - bode plot

3) Basic Physical laws
    - Faraday law, transformer effect
    - Fluid dynamics: laminar vs turbulent flow, Bernouli law
    - Mechanics: stress, strength, Coriolis force
    - Doppler effect
    - Light transmission