EE331 — Homework #11 / Due Friday, Apr. 8, 2020 **at the beginning of class**

This assignment looks worse than it is, but don't wait too long to get started on it. Material for the first four problems was covered by 4.1.20.

1. Ch. 4, Prob. 4.60.

2. Ch. 4, Prob. 4.66.

3. Ch. 5, Prob. 5.4.

4. A magic wand, cylindrical in shape, is made of silver which has a conductivity of 6.2 $\times 10^7$ S/m. Its radius is 0.5 cm, and it's 0.5 m long. When an electric field of 12 mV/m is applied to it, 10^{19} free electrons per cubic meter are available. (Note that an electron has a charge of approximately -1.6 $\times$ 10^{-19} C.) Find (a) the volume charge density of free electrons in the wand, (b) the current density in the wand, (c) the current flowing through the wand (assuming it's connected to something), and (d) the drift velocity of the electrons in the wand. (e) Next calculate the total resistance of the wand, and finally (f) use Joule's law to find the amount of power flowing through the wand (with the 12 mV/m electric field). Note that there are other types of power that flow through the wand, but such information is irrelevant for this problem.

5. Pumpkin pie has a dielectric constant of approximately 65 at microwave frequencies. Find (a) the electric susceptibility of pumpkin pie, (b) the permittivity of pumpkin pie, and (c) the electric flux density in pumpkin pie for an electric field of 1 kV/m. Assume pumpkin pie is linear, isotropic, and homogeneous—i.e., forget about the crust!

6. Ch. 5, (a) Prob. 5.34(a) and (b) Prob. 5.35.

7. Ch. 5, Prob. 5.36.