

E157 Lecture 15 Day Plan

Any questions before quiz

Quiz + Team Quiz + Talk through solution

Handy EM laws and problem solutions:

- B around a wire – Biot-Savart – $\mu I / 2\pi r$
- B in the middle of a coil – Integrate Biot-Savart – $\mu I / 2\pi r$
- Helmholtz coil – two coils lined up to make uniform field in the middle -- $B = 8\mu NI / 5\sqrt{5}r$
- EMF (voltage) induced in a coil by B – Faraday's / Lenz's Law – $-N \frac{d\phi}{dt}$ where $\phi = BA$
- E around a point charge – Integrate over spherical Gaussian surface – $q / 4\pi r^2 \epsilon$
- E around a charge line – $\lambda / 2\pi r \epsilon$
- E around a charge sheet – $\sigma / 2\epsilon$
- E between parallel plates w/ voltage V – σ / ϵ (or half that depending on how you define it), but we don't know sigma, instead we know V. Implies a capacitance of $\epsilon A / d$
- E in a coaxial cable with V on center pin – E is same as infinite line of charge, but we don't know lambda, we know V. Implies capacitance of $2\pi\epsilon L / \ln(b/a)$ where a and b are in/out radius.
- E around a charge hanging out over an infinite plane – figure this out by introducing an image charge and summing fields.

Check-in, office hours