

Ampere's Law Practice Self-graded Quiz
ECEN 3400, Fall 2013
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For all problems, sketch the problem and label all relevant quantities and axes. It is also good practice to state the units of all the quantities.

1. Find the expression for the magnetic field strength vector everywhere inside and outside of a coaxial cable filled with dielectric with relative permeability μ_r . The radius of the inner conductor is a , the inside radius of the outer conductor is b , and the outside radius of the outer conductor is c . Assume a current I flows through the cable.
2. Find the external self-inductance of the cable.
3. Find the expression for the magnetic field strength vector between the conductors of a two-wire line, in the plane of the two parallel wires. The wires have equal radii a and their separation is d .
4. Find the external self-inductance of the two-wire line.
5. Find the expression for the magnetic field strength vector between the conductors of a stripline (two flat parallel strips) with a current I flowing through them. The strips are W wide and spaced D apart.
6. Find the external self-inductance of the stripline.
7. Find the expression for the magnetic field strength of a (1) thin and (b) thick toroidal core. For (1), assume a mean radius. For (2), assume the inner and outer radius and a rectangular cross-section with some height. There are N windings with a current I wound tightly on the core.
8. Find the self-inductance for problem 7. You can do this for (1) air; (2) some magnetic material with μ_r and (3) two different layered magnetic materials (see textbook).
9. Find the internal self-inductance of a two-wire line.