EE 483/583 Antennas for Wireless Communications (Spring 2026)
Homework 7
Monday, March 2, 2026

1) Design a five-element Yagi-Uda antenna for television channel 13 using a copper-pipe boom with an outer diameter of 5/8 inch and brass elements with an outer diameter of 5/16 inch. Assume boom will need to extend **16"** past the <u>center</u> of the reflector to allow antenna to be attached to an antenna mast, and **1"** past the <u>center</u> of the last director for mechanical strength.

   a) Tabulate design specifications (assume 75 Ω feeding transmission line)

   b) Show <u>complete</u> design procedure (i.e., include design figures, spreadsheets, …) in a fashion similar to example given in class. **No matching network is required.**

   c) Make a **scale** drawing of the final antenna designed including boom (transmission line may be omitted) that a machinist could take and use to build the antenna (use centimeters for all dimensions).

2) A PEC folded dipole has length $l = 0.467\lambda$, wire spacing $s = 0.0333\lambda$, and wire diameter $2a = 0.0025\lambda$ at the center frequency of VHF channel 10. Find the characteristic impedance of transmission line mode and equivalent radius of the antenna mode. Then, at the lower edge of channel 7, center of channel 10, & upper edge of channel 13, find: a) the length of the folded dipole in wavelengths (ℓ/λ), b) the input impedance of transmission line mode, c) the input impedance of antenna mode using NEC-2 (include input file(s) & excerpt of output file(s)), d) the exact & estimated input impedance, and e) the VSWR on a 300 Ω feeding transmission line. Show all work.

Due Monday, March 9, 2026.

Note: Assume $c = 2.998 \times 10^8$ m/s.