Topics for Today:

- URL: [http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm](http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm)
- Labs - EE5224 - Begins Wed of Week 3, i.e. Jan 30th
- EERC 134 SGOC lab access for pre-labs and related software.
- Software - Aspen
  - Locals: confirm operation.
  - Online: run via Remote Desktop [remote.mtu.edu](http://remote.mtu.edu)
- Zones of protection, operation and protection strategies
- How to read a one-line (print out week 1 handout “Sub Schem”)
- Instrument transformers: VTs, CTs, CCVTs, MOCTs, etc.
- CTs - pedestal vs. bushing
- CT saturation & accuracy, ratios, multi-ratio Cts
- Next: print out “CT” handout, Study Chapter 5 info on CT saturation & accuracy
SMART GRID CAREER OPPORTUNITIES – EE5224 Lab:

- First protection lab meets next week Wednesday. The weekly cycle for labs will be to meet in EERC SB35 as follows:
  - Wed 10am-noon; Wed 4-6pm; Thurs 4-6pm
  - Only the Wed lab meets during Winter Carnival week
  - Lab 11 (last lab) during Week 13 of semester.

There are currently open slots in the Wed lab sections. You are invited to first orientation lab. Drop/add deadline: Wed Jan 23rd 5pm.

You are encouraged to add this lab, the employers
- consulting firms,
- utilities,
- grid transmission companies,
- corporate or gov’t R&D groups, and
- equipment manufactures

look very highly at this practical experience with state of the art equipment and practical knowledge of relay applications and smart grid technologies. “Relay engineers are like gold.”
Zones of Protection

- Overlapping
- Preferably at CB

(Nota: CT is actual boundary of Zone.)

Zone A

Zone B

EE 5210 - Power Systems Protection
Spring 2001
No CB?

Zone A

Zone B
<table>
<thead>
<tr>
<th>Voltage Level (KV)</th>
<th>BIL (kV)</th>
<th>Min Conductor Spacing</th>
<th>Min Switch Spacing Ph-Ph</th>
<th>Min L-L Phase Clearance</th>
<th>Min Switching Ph-Gnd</th>
<th>Min No. Bells at Deadend</th>
<th>Min Bus Cable Size</th>
<th>V Break</th>
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See up-to-date NESC to verify!
Bushings - HV Lead

Connections into equipment.

4-Bolt Pad

Porcelain Bushing

Dry: Porcelain

"Wet": Oil-Filled

Bushing

Collar

Sheet metal

Tank

Bushing Well

CTs

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