Ongoing List of Topics:

- **URL:** [http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm](http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm)
- Term Project - last few proj/teams being firmed up and getting moving.
  - Follow timeline, see posting on web page (posted in week 5)
  - Formal outline w/complete references complete, get/keep cranking...
- Homework set 10
  - Handout problem, Probs 4.2, 4.3 (a,b,c) - Complete by Friday 5pm
  - Problem 4.4 - complete by Tuesday 5pm.
- Protection fundamentals for 87T, cont’d –
  - Transformer protection/maintenance issues
    - Load Tap Changer - Voltage Reg
    - "Doble Test," Dissolved Gas in Oil
  - a) correct connection of CT secondaries to relays (Lectures 28,29)
  - b) relay settings, to compensate for pri voltage ratio and CT ratios.
  - c) Mismatch problems - due to being forced to use less than full CT ratio, having Pri and Sec CTs with different accuracy levels, LTC. Differential slope of trip characteristic can be 10%, 15%, 25%, etc, to allow for mismatch. Refer to XFRM.pdf!
Notes: 1) Source is not drawn/oriented to match voltage 2) Phasor diagram (pos seq) load is oriented to match pos seq V's.
ANSI STANDARD 30-DEGREE SHIFT WYE-DELTA
\[ V_{A1} = V_{a1} \left(1/30^\circ\right) \]

PRI POS SEQ VOLTAGES

PRI POS SEQ CURRENTS

\[ I_{A1} = I_{AB1} - I_{CA1} \]

SEC POS SEQ VOLTAGES

SEC POS SEQ CURRENTS

\[ V_{A2} = V_{a2} \left(1/-30^\circ\right) \]

PRI NEG SEQ VOLTAGES

PRI NEG SEQ CURRENTS

\[ V_{C2} = V_{c2} \left(1/-30^\circ\right) \]

SEC NEG SEQ VOLTAGES

SEC NEG SEQ CURRENTS

ANSI STANDARD 30-DEGREE SHIFT DELTA-WYE
Example 2: Sec lags Pri by 90°

\[
\begin{align*}
\Delta-Y & \quad \text{sec lags pri: 90°} \\
\text{Pri} & \quad \text{sec} \\
\text{(HV)} & \quad \text{(LV)} \\
\text{H3(C)} & \quad \text{H1(A)} \\
\text{H2(B)} & \quad \text{X2(B)} \\
\text{X0(n)} & \quad \text{X3(C)} \\
\text{X1(a)} & \\
\end{align*}
\]
See Also: Sections 9.6 & 9.8 in text.
Another way to do "book keeping"