Topics for Today:

- URL: [http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm](http://www.ece.mtu.edu/faculty/bamork/EE5223/index.htm)
- EE5223: 36 on-campus students; 12 online students
  - 26 BSEE students; 22 MSEE students
- Labs - EE5224 - Plan to begin in Week 3 (Wed 10am Jan 27th)*
- Bus Configurations (Ch.10, sect 10.1 - 10.10)
  - Single Bus, Single Bus w/tie
  - Main & Transfer
  - Ring Bus
  - Breaker-and-a-half
  - Breaker-and-a-third
- Software - Aspen “OneLiner” (installed on software server)
- Zones of protection - let’s look at Assignment #1
- Zones of protection - generators, motors as fault source.
- Reading Relaying One-Lines (examples posted in Week 1)
EE5224 Lab - 21 registered so far!

Labs begin Wed Jan 27th.

Open lab seats:
• Wed 10-noon       Filled.
• Wed 4-6pm        1 seat open
• Thurs 4-6pm      1 seat open
• Fri 10-noon      1 seat open
Bus Configurations

- Flexibility
  - Maintenance
  - Operation
- Reliability, if something fails
  - "Backup" Strategies
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Breakfast and e-halt
Ring Bus
Demo Bus
Single Bus

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Single Breaker, Single Bus

- Line to another Sub
- Radial Load
- Gen
Radial System

- Backfeed thru sect. sw.
in interim for maintenance.
Single Bus 1/1 Bus 2 12.47-kV

Bus 1

Bus 5

Bus 2
Main & Transfer - Fig. 10.3

Main Bus

Transfer Bus
Double-Bus Double Breaker

Bus 1

Bus 2

NC
NC
NC
Ring Bus - One CB per circuit
Breaker-and-a-half

Bay

Bus 1

Bus 2

Breaker-and-a-third: 4 CBSs/Bay

1.5 CBS/Line
0) CIRCLE THE ZONES OF PROTECTION FOR THE FOLLOWING POWER SYSTEM

1) LOAD CB1 / CB2
2) CB3
3) CB4
4) CB5
5) CB6
6) CB7
7) CB8
8) CB9
9) CB10
10) CB11
11) CB12
12) M1 (Motor)
13) L1
14) L2
15) L3
16) L4
17) T3
18) T4
19) G1
20) G2

b) STATE WHICH CB'S TRIP FOR A FAULT AT:
1) L1
2) BUS III
3) G2
4) T4
5) BUS II
6) LOAD
7) M1

c) FOR A FAULT ON BUS I AND CB3 FAILS WHICH CB OPENS AS BACKUP

d) DOES CB2 NEED TO OPERATE FOR A BUS I FAULT

e) FOR A FAULT ON L4 WHICH CB'S BACK UP CB11
f) FOR A FAULT ON L2 WHICH CB'S BACK UP CB4

g) CB6 & 9 TRIP → WHERE WAS FAULT?

h) CB 6, 9, 8, 11 TRIP → WHERE WAS FAULT
i) CB2 TRIPS WHERE WAS FAULT
j) CB1 TRIPS WHERE WAS FAULT
k) CB7 TRIPS WHERE WAS FAULT

l) FOR A FAULT ON BUS III, WHICH CB'S
1) TRIP FIRST
2) IF THE ONES WHICH SHOULD TRIP FIRST DON'T WHICH ONES SHOULD TRIP NEXT.