Physical 3-Phase Power Laboratory

Focus: To protect transformers, transmission lines, and motors with microprocessor-based relays and circuit breakers.

Digital Relay Testing Stations
Focus: To simulate fault conditions, test relay settings, and analyze event reports within SEL software test environments.

SEL Protection Devices

- SEL-311L – Line Differential Relay
  - Transmission OC protection
  - Distance Protection

- SEL-387E/587 - Current Relay
  - Overcurrent protection
  - Differential protection

- SEL-710 – Motor Relay
  - Undervoltage protection
  - Thermal protection

Background

Motivation
California utility equipment sparked more than 2,000 fires in over three years (LATimes, 2019).

Approach
Create a hands-on protections laboratory illustrating the principles of real-time fault analysis physically and digitally.

Objective
Educate. Prevent. Protect.

Deliverables
- 3 Physical and 8 digital lab benches
- EE518 lab manual
- Textbook of compiled past theses
- YouTube video series

The Value: Learn by doing = Earn by doing

- Avg. Salary of Power System Protection Engineer in California: $25,182, $90,056, $152,604

SEL Relay Test System (RTS)

- Adaptive Multichannel Source (AMS)
  - State-simulation software
  - Current/Voltage waveform generation
  - Circuit breaker operation simulation

Cal Poly Microgrid Team 2018-2019

Top: Richard Terre, Dr. Nafisi, Dr. Shaban, Austin Kurth
Dr. Dehghan, Dr. Taufik, Patricia Lui
Bottom: Do Vo, Virginia Yan, Dr. Poshtan, Vincent Tham
JR Racines, Jesus Morales