ECE 4325 – Electric Power Quality

Topical Outline

Power Quality Concepts
- Transients, Voltage Sags, Voltage swells
- Power Electronic Based End Use Devices
- Waveform Distortion, Harmonics
- Power concepts under waveform distortion
- Equipment Susceptibility
- Power Quality Problems – Classification

Modeling for Power Quality Analysis
- Lumped Parameter Circuits

Distributed Parameter Circuits

Transmission lines, transformers, generators

Distorting loads
- Grounding

Analysis Methods
- Fourier Transforms
- Laplace Transforms
- Numerical Methods
- Special Transforms (Wavelets, Hartley)

Voltage Sags and Swells
- Fault Induced Sags and Swells
- Transferred Voltages
- Impact of grounding
- Mitigation techniques (filters, active compensators, voltage restorers, etc.)

Harmonics
- Generation mechanisms
- Effects of harmonics (resonance, derating, vibrations, etc.)
- Mitigation methods, Filters, UPS
- Standards

Electrical Transients
- Switching Transients (Energization, Cap Switching, In-Rush, Motor Starting, etc.)
- Lightning Induced Transients (Lightning Characteristics, Surges, Shielding)
- Overvoltage Protection (Technology, Surge Protection Devices, Coordination)

Distributed Generation and Power Quality
- Distributed Generation Technologies (Wind, Fuel Cells, Microturbines, etc.)
- Integration and MicroGrids
- Protection and Control of Microgrids