

EE 520: POWER SYSTEM TRANSIENTS (3-0-0:3)

Introduction to transients

Introduction to simple transients in R-L, R-C, RLC Circuit, Origin and nature of power system transient and surges, Equivalent circuit representations, Lumped and distributed circuit parameters, Switching and Lightning overvoltage.

Travelling waves

Wave equation, Reflection and Refraction of Travelling Waves, Attenuation and Distortion of Electromagnetic Waves, Behaviour of travelling waves at line termination, switching operations involving transmission lines, Lattice diagram

Lightning transients

Mechanism of Lightning, Wave shape of the Lightning Current, Direct and Indirect Lightning Stroke, Interaction between lightning and power system.

Switching transients

Damping characteristics, Normal transients - Resistance switching, Capacitor inrush current, Load switching, Abnormal transients - Capacitance switching, Current chopping, Transformer inrush currents, Interruption of small inductive current

Insulation coordination

Basic concept of insulation coordination and insulation level, Statistical approach to insulation coordination, Correlation between insulation and protection levels

Protection of equipment against transient overvoltages

Protection of transmission lines against lightning, Surge suppressors and lightning arrestors, Surge capacitor and reactor, Surge protection of rotating machines, Transient voltages and grounding practice

Modelling and behaviour of power equipment under transient condition

Modeling of transformer, overhead transmission lines, cables, generators, motors, Numerical techniques for transient analysis

Reference book:

- Allan Greenwood, "Electrical Transients in Power System", Wiley & Sons Inc. New York, 1991.
- Lou Vander Sluis, "Transients in power systems", John Wiley & Sons Ltd, 2001
- R. D. Begamudre, "Extra High Voltage AC Transmission Engineering", New Age International, 2009.