

Course Syllabi: UEE844 Transients in Power Systems (L : T : P :: 3 : 1 : 0)

1. **Course number and name:** UEE844; Transients in Power Systems

2. **Credits and contact hours:** Credits: 3.5; Hours: 4

3. **Text book, title, author, and year**

- *Gupta, B.R., Power System Analysis and Design, S.Chand and Company Limited (2003).*
- *Harold, P., Transients in Power System, John Wiley and Sons (1999).*
- *Reinhold Ruder Berg, R.R., Transient Performance of Electric Power systems, MIT Press (1991).*
- *Melipoulus, S., Power System Grounding and Transients, M.Dekker Inc.(1981).*

a. Other supplemental materials

- Nil

4. **Specific course information**

a. Brief description of the content of the course (catalog description)

Transients in Power systems: Simple switching transients, Circuit closing and recovery transients, Arcing grounds, Double frequency transients, Damping, resistance switching.

Abnormal Switching Transients: Current chopping, Capacitance switching, Ferro-resonance, Transformer magnetizing inrush currents, Re-striking phenomenon and its effects on recovery voltage.

Transients in three phase circuits: Switching of three phase transformers, Effect of types of neutral connection, Three phase capacitance switching, Symmetrical component method of analysis of three phase switching transients, Effect of open conductors.

Traveling Waves: Traveling waves in transmission lines, Reflection and refraction of waves, Typical cases and effects of line terminators, Equivalent circuit for traveling wave studies, Forked line, Reactive termination, Bewley lattice diagram, Multi conductor systems.

Lightning: Lightning phenomenon, Line design based on direct strokes, Over voltage due to lightning.

Protection against transients: Protection of power systems against transient over-voltage due to switching and lightning, Lightning arrestors, Surge diverters, Surge capacitors and reactors, Overhead ground wires, Insulation coordination, Computer aids to calculate transient (EMTP).

5. **Specific goals for the course**

After the completion of the course, the students will be able to:

- Reliably distinguish between various switching transients and lightning surges.
- Analyse power system behaviour during switching transients and lightning surges.
- Demonstrate the competence to design the protection scheme of power system equipment using ground wires, surge absorbers and arrestors.
- Decide the insulation level of power system components to withstand the surge voltage.

6. **Brief list of topics to be covered**

- Transients in Power systems
- Abnormal Switching Transients
- Transients in three phase circuits
- Traveling Waves

- Lightning
- Protection against transients