

**M.TECH FIRST SEMESTER  
POWER SYSTEM TRANSIENTS**

**17EEPC1T6C**

**Lecture: 4 periods/week**

**Credits: 4**

**Internal Assessment: 40 marks**

**End Semester Assessment: 60 marks**

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**Course objective:**

The aim of the course is to give a fair knowledge about transient's features of power system and to impart the knowledge of protection of system against transients.

**Course Learning Outcomes:** At the end of the course the student will be able to

1. Identify the origin and nature of switching transients.
2. Understand abnormal switching transients.
3. Assess the lightning transients and design of tower footing resistance.
4. Analyze the protection of apparatus against transients.

**UNIT-I: SWITCHING TRANSIENTS**

Source of transients – Various types of power systems transients – Effect of transients on power systems – importance of study of transients in planning – Circuit closing transients – RL circuit with sine wave drive – Double frequency transients – Observations in RLC circuit and basic transforms of the RLC circuit – Resistance switching – Equivalent circuit for the resistance switching problems – Equivalent circuit for interrupting the resistor current

**UNIT-II: LOAD SWITCHING**

Equivalent circuit – Waveforms for transient voltage across the load switch – normal and abnormal switching transients – Current suppression – Current chopping – Effective equivalent circuit –Capacitance switching – Effect of source regulation – Capacitance switching with a restrike – With multiple restrikes –Illustration for multiple restriking transients – Ferro resonance.

**UNIT-III: LIGHTNING TRANSIENTS**

Causes of over voltage – Lightning phenomenon – Charge formation in the clouds – Rate of charging of thunder clouds – Mechanisms of lighting strokes – Characteristics of lightning strokes –Factors contributing to good line design –Tower footing resistance – Interaction between lightning and power system

**UNIT-IV: PROTECTION OF SYSTEM AGAINST TRANSIENTS:**

Lightning shielding – Surge Suppressors – Lightning arrester – Surge capacitors – Effect of grounding practices. Methods of neutral grounding and their effect on system behaviour. Insulation coordination, requirement in surge protection of lines and equipment. Introduction to use of EMTP, MATLAB and PSCAD/EMTDC packages to solve transient problems.

**TEXT BOOKS:**

1. Allan Greenwood, "Electrical Transients in Power Systems", 2nd Edition, Wiley Interscience, 1991.
2. Begamudre, R.D., "Extra High Voltage AC Transmission Engineering", 3rd Edition, NewAge International, 2009.

**REFERENCE BOOKS:**

1. Transient Analysis of Electric Power Circuits Handbook, Shenkman, Arieh L, Springer 2005
2. Transients in Power Systems ,Lou van der Sluis John Wiley & Sons Ltd. 2001
3. Transients in Power System , V. A. Vanikov, Mir Publications, Moscow.
4. Transients in power systems, Harold A. Peterson, Wiley, 1951
5. Naidu, M.S. and Kamaraju, V., "High Voltage Engineering", 2nd Edition, Tata McGraw