ECE 611: Transients in Power Systems
Fall 2023
Class Type: Online

Description: Transient performance of power systems with lumped properties, interruption of arcs, restriking voltage, RL, RC, and LC circuit characteristics, resonance, RLC circuits, harmonic oscillations, current suppression, ferroresonance, lightning and lightning protection, ground potential rise, corona, electrostatic and electromagnetic phenomena, and travelling waves in transmission lines. Additionally, we will reference global regulatory and industrial product compliance standards for actual product requirements related to transient suppression and control.

The class is very practical in nature. Less derivation from mathematics, more derivation from industry practices, statistical and empirical data. More of an awareness of not blowing up your customer's equipment, or yours!

Prerequisite: All Engineering Graduate Students are encouraged to take this course

Text: Allan Greenwood, "*Electrical Transients in Power Systems*," 2nd Edition, Wiley-Interscience, 1991

Instructor: Don Gies, Adjunct Professor
          Phone: 732-207-7828 (cell)   Email: ddgies@njit.edu

Classroom: Online – No classroom assigned.

Office hours: By appointment by WebEx.

Topics:
- Introduction and Transient Fundamentals
- Electrical ratings vs. Transient performance
- RL, RC, and LC Circuits
- RLC Crcuits, Oscillations, and Damping
- Abnormal Switching Transients
- Ferroresonance
- Lightning and Lightning Protection Systems
- Ground Potential Rise
- Corona
- Electrostatic and Electromagnetic Phenomena
- Traveling Waves and Other Transients on Transmission Lines
- Surge Protection

In addition, transient requirements or recommendations from the following organizations may be referenced in class:
- National Fire Protection Association (NFPA), including the National Electrical Code
- International Electrotechnical Commission (IEC)
- Underwriters Laboratories (UL)
- IEEE

References: The following may be referenced for further information:

- J.C. Das, "*Transients in Electrical Systems"* McGraw-Hill, 2010
- Lou van der Sluis, "*Transients in Power Systems*" Wiley, 2001
- J.D. Glover, M. Sarma, T. Overbye "*Power System Analysis and Design"*, 2011
- J.A. Martinez-Velasco, "*Power System Transients: Parameter Determination"*. CRC Press, 2009
- IEEE C2, *"National Electrical Safety Code"*
- *"Electric Currents Abroa*d," U.S. Department of Commerce, International Trade Administration, 2002

Grading Policy:

- Homework-20% - Homework is practice, not graded for correct answers, but must be completed and submitted on the class Canvas site.
- Midterm Exam-30%
- Final Research Paper, Presentation, and Peer Review (on selected topic concerning transients in power systems)-50% (Paper 35%, Presentation 10%, Peer Review 5%)
  - *Paper and presentations will be cleared for originality through Turnitin.com, via the class Canvas site.*

Class Rules:

- Note the day that homework assignments are due.
  - Collaboration with classmates is not discouraged, *but identical homework submittals will be given a zero* (example: Identical typed print-offs, with the same typos).
- *Homework may be handed in up to 2 weeks after due for full credit.*
  - *Afterwards, only half credit is possible*
- Electronic submission is allowed. All paper submissions must have name on each page.
- All electronic submissions must have the students name, and the homework number on the file name and on the first page of the file.
- **No Cell Phones or Computers during exams. Only Calculators**. (Exception: For online ProctorU exams, cell phones may be used only to scan in the test results)
- Participate! This class should be interactive. Your comments contribute to the overall awareness of transients and their prevention.

Academic Integrity/Honor code:

- Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

- Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu