Course number
ENGR3499

Course title
Special Topics in Electrical and Computer Engineering: Nonlinear Circuit Analysis

Semester(s) covered
Fall 2007

Instructor
José Oscar Mur-Miranda, jomm@olin.edu, (781)292-2544

Designation as ‘required’ or ‘elective’ course
Elective electrical and computer engineering concentration

Course (catalog) description
Nonlinear circuits are commonly used in the design of electrical systems. Examples include sinusoidal generators, relaxation oscillators, power supplies, DC-DC converters, and signal transducers. Students will characterize the behavior of several of these circuits using state-space tools together with linear circuit theory. The results will be used to design physical implementations. Emphasis will be placed on the validation of theory using empirical data.

Prerequisites
ENGR 2420 (Introduction to Microelectronic Circuits) or permission from the instructor.

Textbook(s) and/or other required material
The course does not require any textbook. The books below are optional. All books are available in the library.


Course website
http://faculty.olin.edu/jmurmiranda/nonlincptsf07.htm

Course objectives
By the end of the course, the students should be able to:
- Model and analyze nonlinear circuit elements.
- Analyze networks containing nonlinear elements.
- Validate circuit models using empirical data.
**Topics covered**

1. V-I plane, load line, graphical methods
2. Piecewise linear models, method of assumed states, piecewise linear diode and opamp models
3. 1st order linear dynamics
4. 1st order nonlinear dynamics, stability of solutions
5. Bistable systems, memory
6. Relaxation oscillators, stiff equations
7. Weakly nonlinear oscillator
8. Applications involving BJT's and/or MOSFET's (e.g., DC-DC converters, oscillators, current limiter, voltage regulators
9. Nullators and norators

**Class/laboratory schedule and location**

MR 1pm-2:50pm in AC304

**Relationship of course to program outcomes (Olin competencies) and method of assessment**

Extensive development (5) of Quantitative Analysis and Diagnosis at an advanced level will be assessed through weekly summaries, problem sets and/or laboratories. Collaboration policy will be discussed in the first class. Assignments are due at class time. Late assignments will be penalized. The lowest two scores will be eliminated to allow for unforeseeable circumstances.

**Person(s) who prepared this description**

José Oscar Mur-Miranda