

# ECE 521 Fall 2016

## Analog Circuit Simulation

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<b>Course Objective:</b>	Learn the theoretical and practical aspects of building a circuit simulator such as SPICE and be exposed to the current state of the art and the future challenges.
<b>Prerequisites:</b>	A background in circuit theory, ability to write software in (C, C++, or Fortran), and an appreciation for numerical methods
<b>Grading:</b>	Homework (4-5 assignments) 40% (Part 1 - 10%; Part 2 - 30%) Exam 30% (M 11/21/16) Final Project 30%
<b>Cheating Policy:</b>	You may work together on homeworks but not copy someone else's work. <b>Cheating is unacceptable.</b>
<b>TextBook:</b>	Lecture notes.
<b>References:</b>	F. N. Najm, <i>Circuit Simulation</i> , John Wiley & Sons, 2010. J. Vlach and K. Singhal, <i>Computer Methods for Circuit Analysis and Design</i> , Van Nostrand Reinhold Co, 1994. W. J. McCalla, <i>Fundamentals of Computer-Aided Circuit Simulation</i> , Kluwer Academic Publishers, 1988. L. T. Pillage, C. Visweswaraiyah, and R. A. Rohrer, <i>Electronic Circuit and System Simulation Methods</i> , McGraw Hill, 1995. L. O. Chua and P. M. Lin, <i>Computer-aided Analysis of Electronic Circuits</i> , Prentice-Hall, 1975. K. S. Kundert, J. K. White, and A. Sangiovanni-Vincentelli, <i>Steady-State Methods for Simulating Analog and Microwave Circuits</i> , Kluwer Academic Publishers, 1990.

### Course Outline

<b>(1 week)</b>	Formulation of Circuit Equations: Nodal Analysis, Modified Nodal Analysis (MNA), and Sparse Tableau Approach (STA)
<b>(1 week)</b>	Solution of linear equations: Direct and iterative methods, Sparse-matrix techniques
<b>(1 week)</b>	DC analysis: Solution of nonlinear equations and convergence issues
<b>(3 weeks)</b>	Small-signal ac, transient, and Fourier analyses. Anatomy of a circuit simulator
<b>(1 week)</b>	Sensitivity and noise analyses
<b>(1 week)</b>	Pole/zero analysis and moment matching methods
<b>(2 weeks)</b>	Latest advances and analysis methods for RF circuits

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