MATLAB is an Effective Tools for Solving Electric Circuit Problems

Last couple of years, I have been focusing to teach low level electric circuit courses using flipped classroom approaches. I have PowerPoints and videos of lecture notes on Blackboard. Students watch the videos before the class and prepare some questions from the videos and PowerPoints lecture notes. After quick explanation of the theory in class, we spend more time in discussions; answering students' questions, simulations, and work on extra problems and exercises. Ultimately flipping a classroom gives me, as an instructor, more time to work with students individually. This increases the interaction with the students in the class, gives me a chance to know each students' learning style, and allows me to personalize their learning.

In my experience, I realized that most of our new generation students are "visual" or "kinesthetic" learners, whose understanding of engineering theories is enhanced by hands-on activities, simulation, and needs to be able to break down the problems. I recommend our students to use computational tools such as MATLAB to solve the problems to validate the results. Computational skills helps electric and computer engineering students break down problems into steps to develop their understanding abilities in order to help them in their future classes.

MATLAB is one of the best an effective tool for solving electric circuits' problems quickly. Simple functions such as calculating the equivalent resistance or impedance of parallel connection of resistors, capacitors, and inductors; conversion from Cartesian coordinates to polar coordinates; conversion from polar coordinates to Cartesian coordinates; conversion from the wye configuration to delta configuration; and conversion from delta configuration to wye configuration provide accurate answers quickly. These simple functions can be part of scripts that enable us to find solutions to typical circuit problems. Making plots as a function of any elements quickly in MATLAB help the students to visualize the effects of changes.

The complexity of taking the inverse Laplace transforms increases as the order increases. For example, after finding inverse Laplace transforms by hand using partial fraction expansion, answers from MATLAB are provided as a comparison. MATLAB can be used to solve equations and to find integrals, transforms, inverse transforms, and transfer functions. The applications of MATLAB to electric circuit analysis can be demonstrated to solve problems quickly. Some MATLAB function templates can be provided to

students and students can convert a typical homework problems into a computational problems by filling in the function template for the calculations.