

Concept Mapping Approach for Teaching Transmission Line Theory

Rajesh C. Paryani*, K.C. Gupta, and Parveen F. Wahid
University of Central Florida, Orlando, FL, 32816
<http://www.eecs.ucf.edu/>

The use of web-based and CDROM-based concept-modules has been established (K.C. Gupta, R. Ramadoss, and H. Zhang, IEEE Trans. Micro. Theory Tech., vol. 51, no. 4) as an effective method of RF and Microwave education. A generic structure for developing modules and a case study on RF and microwave network characterization with embedded computational tools has been presented. This paper expands upon these ideas by developing a concept module on Transmission Lines complete with embedded interactive computational tools. The development of underlying theory is directly linked to primary concepts and a multitude of related transmission line topics. Mapping of interrelated ideas is explicitly developed via concept maps which link to other sections, all of which return to the central progression of concepts. The user may choose to pause to view the derivation of key equations as well as important applications before proceeding, or can continue through the main path and come back to these concepts later. Throughout the module interactive Java applets and an interactive Smith Chart tool are used to illustrate the theory, both numerically and graphically. Examples of operations developed in various computational applets include demonstration of the effects of moving a load down a line, viewing standing wave patterns, calculation of Γ , SWR, and Z_{in} and the calculation of impedances, voltages, currents, and power. Perhaps most importantly, the module is developed in a fashion which provides for easy linking to future modules on other concepts. The use of such modules in a microwave curriculum will be discussed with emphasis on their adaptability and their clear presentation of concepts.