

The Finite Difference Time Domain (FDTD) Technique with Emphasis on Antennas and RFID Applications

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This short course will provide an in depth overview of the finite difference time domain technique (FDTD) as applied to the design of printed antennas and RFID tags. Participants in this course should have basic knowledge of electromagnetics, antenna parameters, and microwave network theory. They will learn from this course the basics and advanced topics of the FDTD method as presented in the book “The Finite Difference Time Domain Method for Electromagnetics: with MATLAB Simulations”, by Atef Elsherbeni and Veysel Demir, SciTech, 2009. They will also learn how to build a MATLAB working code in order to gain more capabilities and to have a source code for future development for special applications. The book will be the participant’s guidance through the development of a complete FDTD MATLAB package. The following list of topics will be presented followed by exercises and applications such as microstrip printed antennas, microstrip filters, slot antennas, and RFID tags.

Topics to be presented

Morning Session	Afternoon Session
Basic of FDTD Equations Numerical Stability and Dispersion	ABC – PML with 2D Applications CPML with 3D Applications
Building of Basic Objects Voltage and Current Sources Resistors, Inductors, and Capacitors	Near to Far Field Transformations Examples for Far Field Applications
Waveforms and Time Parameter Selection S-Parameters Thin Wire Approximation Microstrip Feed Designs	Implementation of Non-Linear Circuit Elements Diode FDTD Updating Equations Dependent Sources Updating Equations Examples Containing Lumped Elements



Dr. Atef Z. Elsherbeni is a Professor of Electrical Engineering and Associate Dean of Engineering for Research and Graduate Programs, the Director of The School of Engineering CAD Lab, and the Director of The Center for Applied Electromagnetic Systems Research (CAESR) at The University of Mississippi. In 2004 he was appointed as an adjunct Professor, at The Department of Electrical Engineering and Computer Science of the L.C. Smith College of Engineering and Computer Science at Syracuse University. On 2009 he was selected as Finland Distinguished Professor by the Academy of Finland and TEKES. Dr. Elsherbeni has conducted research dealing with scattering and diffraction by dielectric and metal objects, finite difference time domain analysis of passive and active microwave devices including planar transmission lines, field visualization and software development for EM education, interactions of electromagnetic waves with

human body, RFID and sensors development for monitoring soil moisture, airports noise levels, air quality including haze and humidity, reflector and printed antennas and antenna arrays for radars, UAV, and personal communication systems, antennas for wideband applications, antenna and material properties measurements, and hardware and software acceleration of computational techniques for electromagnetics. Dr. Elsherbeni is the co-author of the book “The Finite Difference Time Domain Method for Electromagnetics With MATLAB Simulations”, SciTech 2009, the book “Antenna Design and Visualization Using Matlab”, SciTech, 2006, the book “MATLAB Simulations for Radar Systems Design”, CRC Press, 2003, the book “Electromagnetic Scattering Using the Iterative Multiregion Technique”, Morgan & Claypool, 2007, the book “Electromagnetics and Antenna Optimization using Taguchi's Method”, Morgan & Claypool, 2007, and the main author of the chapters “Handheld Antennas” and “The Finite Difference Time Domain Technique for Microstrip Antennas” in Handbook of Antennas in Wireless Communications, CRC Press, 2001. Dr. Elsherbeni is a Fellow member of the Institute of Electrical and Electronics Engineers (IEEE) and a Fellow member of The Applied Computational Electromagnetic Society (ACES). He is the Editor-in-Chief for ACES Journal and an past Associate Editor to the Radio Science Journal.