OS7201 Electromagnetic Analysis Using FDTD Method

Homework #2 Due: 10/26/2022 at 12 p.m.

1. (100%) In this homework, you are required to implement 1D-FDTD code for a Gaussian pulse propagating in the $\pm z$ directions. Assume the highest frequency component of the pulse is 1 GHz. To practice implementing the grid resolution into the code, a dummy dielectric slab ($\epsilon_r = 1.0$ and $\mu_r = 1.0$) of 0.3 m in thickness is assumed to exist in 1D free space (such that no actual structure exists within the simulation region).

   Revise your 1D-FDTD MATLAB code for the E_y/H_x mode developed in Homework #1 to include the following:
   - Incorporate a simple Gaussian soft source emerging from the midpoint of the grid by modifying the field amplitude there.
   - Implement the perfect boundary conditions (i.e. perfectly absorbing conditions) on both edges of the 1D grid.
   - Show the propagation of both E_y and H_x fields.

   Make sure your code is clean and well-commented and the figures look professional. You should be able to repeat the animation similar to the one shown on p. 14 of video lecture 6 provided by Prof. Rumpf.

   Upload your m-file to the Homework 2 folder on the course website.

   Note:
   1. Initialize the fields to zero before the main FDTD loop starts.
   2. Follow exactly the block diagram at the end of Lecture 6.