

**Speaker: Dr. Kismet Hong Ping**

**Title: Electromagnetic Inverse Scattering Technique for Breast Cancer Detection**

The Forward-Backward Time-Stepping (FBTS) technique is an approach to active microwave imaging applied to the breast cancer detection based on high contrast of electric properties between normal breast tissues and malignant tumor. It is formulated in the time-domain utilizing Finite-Difference Time-Domain (FDTD) method to reconstruct the microwave properties of the breast. To demonstrate the validity of the FBTS technique, both two-dimensional (2-D) and three-dimensional (3-D) cases were assessed via numerical simulations and experimental measurements. In order to minimize the computational time, parallel 3-D FBTS algorithm was implemented to perform in parallel processing environment so that the same number of transmitter points acquired for both direct and inverse scattering problems. A simple dielectric “phantom” (breast-like) model was designed to have a configuration similar to human breast tissues. Similarly, the 3-D MRI-derived breast model was analyzed utilizing four illumination schemes, which depending on the different microwave transmitter/receiver positions. To analyze the efficacy of the parallel 3-D FBTS, a wooden hollow cylinder from the experimental data was performed. Reconstruction results demonstrated that the FBTS inverse scattering technique has the ability to accurately detect and localize the presence of tumor and also provide evidence that the technique should be applicable to a practical breast cancer detection system.