Technical Seminar
Organized by
Radio Communication Engineering Department (RaCED) and IEEE AP/MTT/EMC Malaysia Chapter

You are cordially invited to a seminar on

EM Modeling of Artificial Magnetic Conductors and Soft and Hard Surfaces

Speaker: **Professor Ahmed A Kishk, University of Mississippi, USA**

Time/Date: **9.30 – 11:30 am, 7 Jan 2011 (Friday)**

Venue: **P03 Video Conference Room, Faculty of Electrical Engineering, UTM JB Johor Malaysia**

Abstract: The term soft and hard surfaces is recently used with surfaces based on the direction of propagation along the surface. Soft surfaces are long been used in horn antennas as transverse corrugations to improve the radiation characteristics. A grounded dielectric slab loaded with transverse metallic strips can realize also soft surfaces. Longitudinal corrugations or longitudinal strips can realize hard surfaces. Such surfaces have recently found some applications and relation with the electromagnetic band gap surfaces (EBG) and artificially magnetic conducting surfaces (AMC). The analysis of these surfaces using exact boundary conditions is tedious and sometimes is limited to certain geometrical constraint when periodicity has to be analyzed using Floquet modes. Recently, simplified boundary conditions have been developed to analyze such surfaces. Such boundary conditions remove the geometrical restrictions and able the analysis of complex surfaces with different types. These asymptotic boundary conditions are used under the condition that the structure period is very small compared to the wavelength and ideally when the period approaches zero. Three types of asymptotic boundary conditions are considered. The asymptotic strips boundary conditions (ASBC) to be used with strips loaded surfaces. The asymptotic corrugations boundary conditions (ACBC) to be used with corrugated surfaces. The third type can be used with strips or corrugations under the assumption of ideal soft or hard conditions. The surfaces can be model as periodic surface of perfect electric conducting strip (PEC) attached to a perfect magnetic conducting strip (PMC). This boundary condition is referred to as PEC/PMC surface. Also, the classical model of surface impedance boundary condition can be used with some of these surfaces. A review related to these boundary conditions will be given. We will show the implementation of these boundary conditions in method of moments (MoM) based on surface integral equations and the finite difference time domain method (FDTD). The advantages of using the asymptotic boundary conditions will be illustrated. The relation between the soft surfaces and the electromagnetic band gap (EBG) surfaces will be discussed. We will present several examples of applications such as compact horn antennas with soft or hard surfaces, reduction of blockage from cylindrical objects and others applications. A newly developed guiding structure will be presented, which is based on the properties of the AMC with low loss. Also, a demonstration of using AMC in packaging microwave circuits will be presented.

About the Speaker:

Ahmed A. Kishk received the BS degree in Electronic and Communication Engineering from Cairo University, Cairo, Egypt, in 1977, and in Applied Mathematics from Ain-Shams University, Cairo, Egypt, in 1980. In 1981, he joined the Department of Electrical Engineering, University of Manitoba, Winnipeg, Canada, where he obtained his M.Eng and PhD degrees in 1983 and 1986, respectively.

From 1977 to 1981, he was a research assistant and an instructor at the Faculty of Engineering, Cairo University. From 1981 to 1985, he was a research assistant at the Department of Electrical Engineering, University of Manitoba. From December 1985 to August 1986, he was a research associate fellow at the same department. In 1986, he joined the Department of Electrical Engineering, University of Mississippi, as an Assistant Professor. He was on sabbatical leave at Chalmers University of Technology, Sweden during the 1994-1995 academic years. He is now a Professor at the University of Mississippi (since 1995). He was an Associate Editor of *Antennas & Propagation Magazine* from 1990 to 1993. He is now an Editor of *Antennas & Propagation Magazine*. He was a Co-editor of the special issue,"Advances in the Application of the Method of Moments to Electromagnetic Scattering Problems," in the *ACES Journal*. He was also an editor of the *ACES Journal* during 1997. He was an Editor-in-Chief of the *ACES Journal* from 1998 to 2001. He was the chair of Physics and Engineering division of the *Mississippi Academy of Science* (2001-2002). He was a guest Editor of the special issue on artificial magnetic conductors, soft/hard surfaces, and other complex surfaces, on the *IEEE Transactions on Antennas and Propagation*, January 2005.

His research interest includes the areas of design of millimeter frequency antennas, feeds for parabolic reflectors, dielectric resonator antennas, microstrip antennas, EBG, artificial magnetic conductors, soft and hard surfaces, phased array antennas, and computer aided design for antennas. He has published over 200-refereed Journal articles and 27 book chapters. He is a coauthor of the ***Microwave Horns and Feeds*** book (London, UK, IEE, 1994; New York: IEEE, 1994) and a coauthor of chapter 2 on ***Handbook of Microstrip Antennas*** (Peter Peregrinus Limited, United Kingdom, Ed. J. R. James and P. S. Hall, Ch. 2, 1989). Dr. Kishk received the 1995 and 2006 outstanding paper awards for papers published in the *Applied Computational Electromagnetic Society Journal*. He received the 1997 Outstanding Engineering Educator Award from Memphis section of the IEEE. He received the Outstanding Engineering Faculty Member of the Year on 1998 and 2009, Faculty research award for outstanding performance in research on 2001 and 2005. He received the Award of Distinguished Technical Communication for the entry of IEEE Antennas and Propagation Magazine, 2001. He also received The Valued Contribution Award for outstanding Invited Presentation, "EM Modeling of Surfaces with STOP or GO Characteristics – Artificial Magnetic Conductors and Soft and Hard Surfaces" from the Applied Computational Electromagnetic Society. He received the Microwave Theory and Techniques Society **Microwave Prize** 2004. Dr. Kishk is a ***Fellow*** member of IEEE since 1998 and Fellow of Electromagnetic Academy. He is a member of Antennas and Propagation Society, Microwave Theory and Techniques, Sigma Xi society, U.S. National Committee of International Union of Radio Science (URSI) Commission B, Phi Kappa Phi Society, Electromagnetic Compatability, and Applied Computational Electromagnetics Society.

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