"Spatially-Variant Periodic Structures in Electromagnetics"

IEEE MTT/AP Orlando Chapter, CREOL, & Raj Mittra Distinguished Lecture Program

DATE/TIME: Thursday, September 8th, 2016 (5:00 PM-6:00 PM)

SPEAKER: Dr. Raymond C. Rumpf
Associate Professor, University of Texas at El Paso

ABSTRACT:

Periodic structures, or lattices, have proven to be one of the most enabling technologies of the 21st century. They allowed us to make objects invisible, to manipulate light and sound like we do electricity in computer chips, to dramatically reduce size and weight of structures while maintaining mechanical strength, and appear to break fundamental laws of physics. Despite these accomplishments, profound physical mechanisms still remain hidden inside the lattices that have yet to be effectively utilized. Electromagnetic fields cannot be manipulated inside homogeneous media. There must exist an interface, a gradient, or some form of inhomogeneity. Uniform lattices can be compared to homogeneous media that have limited usefulness. To unlock the hidden physics, lattices must be made macroscopically inhomogeneous without also unintentionally deforming the unit cells. Bending, twisting, and otherwise spatially varying a periodic structure in this manner requires impossible geometries, so until recently it has only been accomplished in simple and canonical configurations. A breakthrough by the EM Lab at the University of Texas at El Paso has led to a method for generating spatially-variant lattices (SVLs) without unintentionally deforming the unit cells, thus preserving their electromagnetic properties. Using this tool, the EM Lab is exploring new physics enabled by SVLs. In collaboration with the Kuebler Lab at the University of Central Florida, a spatially-variant photonic crystal (SVPC) was designed that achieved the tightest bend of optical beam ever reported in the literature. In other work, the EM Lab showed that a spatially-variant anisotropic metamaterial (SVAM) can be used to electromagnetically decouple two electrical components placed in close proximity. This talk will discuss the algorithm for generating SVLs as well as some of the new device concepts it has enabled so far.

ABOUT THE AUTHOR:

Dr. Raymond C. Rumpf is an Associate Professor of Electrical and Computer Engineering at the University of Texas at El Paso (UTEP), and has a joint appointment in the Computational Science program. In Fall 2010, Raymond formed the EM Lab at UTEP with a mission to develop revolutionary technologies enabled by digital manufacturing. Prior to joining UTEP, Raymond was the Chief Technology Officer for Prime Photonics where he helped transform the company's technology portfolio from exclusively fiber optic sensors to an array of technologies for extreme applications. Raymond earned his BS and MS in Electrical Engineering from the Florida Institute of Technology in 1995 and 1997 respectively. He earned his PhD in Optics in 2006 from the University of Central Florida. In 2015, Raymond was awarded the highly prestigious University of Texas Regents' Outstanding Teaching Award. Raymond has been awarded over a dozen United States patents and has authored dozens of peer-reviewed journal articles. He is an Associate Editor for SPIE Optical Engineering, Program Chair for Advanced Fabrication Technologies at Photonics West, and a Senior Member of SPIE. He is also a member of IEEE, OSA, and ARRL. Raymond is active in outreach with local grade schools in El Paso as well as mentoring students in third-world countriesformer ABET ECE PEV, CEAA.

LOCATION: **University of Central Florida**
CREOL 103

Organizer: Prof. Raj Mittra and
Michael Trampler
(904)556-9449, Michael.Trampler@gmail.com

The lecture is jointly sponsored by The IEEE/AP Distinguished Lecture series, CREOL, and by Raj Mittra Distinguished Lecture Program of the College of Engineering at UCF