

## SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING  
Faculty of Engineering  
Website: <https://www.eng.nus.edu.sg/ece/>

**Area: Microelectronic Technologies & Devices**

**Host: Assoc Prof Yang Hyunsoo**

TOPIC	:	Coherent spin wave generation with resonant magnonic cavities
SPEAKER	:	Prof. Anil Prabhakar, IIT-Madras, India
DATE	:	16 September 2019, Monday
TIME	:	11am to 12pm
VENUE	:	E3-06-01, Engineering Block E3, Faculty of Engineering, NUS

### ABSTRACT

Meta-materials with alternating layers of magnetic materials, or materials with air-holes have are used to tailor the spin wave band gaps, in a manner analogous to photonic crystals. These magnonic crystals offer us new ways to explore coherent spin wave oscillations in resonant cavities, bringing us one step closer to the development of a SWASER, the spinwave equivalent of the optical laser. Similarly, magnonic crystals waveguides (MCWs) are created by omitting a series of holes in a magnonic crystal. Such periodic lattices are easily extended to include many magnonic crystal cavities that are evanescently coupled to the MCW. The analysis of such structures was possible using the plane wave method and micromagnetic simulations, for metallic magnetic films such as NiFe. A similar analysis of periodic structures in insulating films such as YIG proves to be more challenging as the low spin wave damping offers us millimeter sized devices, with an exchange length in nm. However, YIG does offer the advantages of rapid prototyping using a femtosecond laser. We describe our efforts in designing such devices and the challenges involved in both simulating and fabricating magnonic crystal cavities. Finally, we end with ideas for a new generation of microwave devices for use in communications and in computing.

### BIOGRAPHY

Dr. Anil Prabhakar received his PhD in 1997 from Carnegie Mellon University, with a dissertation on the Nonlinear Spin-wave Optical Interactions. He has been with the faculty at the Dept. of Electrical Engineering, IIT-Madras since 2002 with current research interests are in the areas of magnonics, photonics, and assistive technologies for persons with disability. He is actively involved in translational research and is a Founder-Director of the IITM incubated companies Unilumen Photonics and QNu Labs, working on fibre lasers and on quantum communications, respectively. Prior to joining IIT Madras, he led the design team at ReadRite Corporation manufacturing recording heads for disk drive storage. He has authored more than a 100 publications, is a co-author of the text Spin Waves: Theory and Applications, and currently serves on the Editorial Boards for Scientific Reports (Nature) and the IEEE Transactions on Magnetics. He is also a member of the LIGO Scientific Collaboration for the detection of gravity waves.

<https://www.eng.nus.edu.sg/ece/highlights/events/>