

Chez Pierre

Presents ...

Thursday, February 12, 2015

12:00pm

MIT Room 4-331



Special Chez Pierre Seminar

Victor Brar

California Institute of Technology

“Surface Plasmons and Impurity States in Graphene”

Graphene, an atomically thin sheet of carbon atoms, provides a unique platform to study quasiparticle interactions and to create optical metamaterials with novel properties. The 2D nature and linear band structure of graphene give rise to a semi-metal behavior, with tunable dielectric properties and a high electron mobility. In the DC regime, these properties allow graphene to display novel screening behavior in the presence of charged impurities, which I will show can be probed directly using scanning tunneling spectroscopy (STM). At optical (mid-IR) frequencies, the graphene dielectric function is strongly perturbed by the presence of collective excitations known as surface plasmon polaritons (SPPs), which are optical modes - supported by free carriers - that are bound to the graphene sheet. These modes show a number of remarkable properties, including a carrier density dependent dispersion relation, and wavelengths that are more than 100 times shorter than freespace. I will show how the surface plasmons in graphene can be harnessed to create infrared metasurfaces that have tunable optical properties. These materials will be shown to exhibit extreme light-matter interactions that can control the macroscopic absorption and emission properties of nanostructured dielectric stacks.