

# Center for Quantum Science and Engineering CQSE

Weekly Seminar  
March 19, 2010 (Friday)

**Time:** 2:20pm ~ 5:20pm

**Title:** Quantum transport in spintronic and graphene nanostructure  
自旋電子及石墨烯奈米系統中的量子傳輸現象

**Speaker:** Prof. Branislav K. Nikolić, Department of Physics and  
Astronomy and Center for Spintronics and Biodetection,  
University of Delaware, USA

**Place:** Rm112, CCMS & New Physics Building, NTU

## Syllabus:

The course provides a hands-on experience for graduate students in sciences (physics, chemistry) and engineering (electrical, chemical, materials), as well as advanced undergraduates, to analyze electronic structure and transport properties of basic classes of carbon, semiconductor, and magnetic nanostructures explored at the current research frontiers.

\* Nanostructures in equilibrium: two-dimensional electron gas, graphene, carbon nanotubes, quantum wires and dots, magnetic nanostructures, elements of density functional theory (DFT).

\* Nanostructure out of equilibrium: conductance quantization, weak and strong localization, quantum Hall effect, interferometers, magnetic tunnel junctions, Coulomb blockade, I-V curves.

\* Theoretical techniques: Boltzmann equation, spin and charge diffusion equations, Landauer-Büttiker scattering formalism, nonequilibrium Green function (NEGF) techniques.

\* Experimental techniques: Scanning Tunneling and Atomic Force Microscopy.

\* Applications: nanoelectronics, molecular electronics and spintronics.

In this mini-course, Prof. Dr. Branislav Nikolić will provide a general introduction to some of the topics above and then focus on SPECIFIC theoretical/computational techniques (such as NEGF, NEGF+DFT, etc.) that an advanced student can use to solve problems of current interest.

Reference: [https://wiki.physics.udel.edu/phys824/Main\\_Page](https://wiki.physics.udel.edu/phys824/Main_Page)

