

# **Courses delivered by University of Chinese Academy of Science, National Centre for Nanoscience and Technology**

## **1) Nano Electronic Materials**

Instructor(s)-in-charge: Prof. Liming Xie

This course will first give a general review on nano electronic materials, including structure, synthesis and properties. And then introduce typical nano electronic materials in details (quantum dots, nanowires, carbon nanotubes, graphene, two-dimensional materials beyond graphene).

## **2) Nanoelectronics Quantum phenomena in nanoscale systems**

Instructor(s)-in-charge: Prof. Xiaohui Qiu

The course will cover the following areas: concepts in electron transport, current flow in nanostructures, mesoscopic electron transport, the quantization of charge, and conductance and their consequences for transport, Landauer (transmission) formalism. The chosen examples will include quantum wires, low dimensional semiconductor structures, quantum dots, graphene, carbon nanotubes, molecular transistors, and other timely subjects in nanoelectronics. One session will be devoted to nano fabrication. The course also includes two laboratory experiments: A. Measurement of the Quantum Hall effect and Shubnikov de Haas oscillations in a two dimensional electron gas at low temperatures (4 Kelvin) B. Fabrication (or measurements) of graphene quantum dots.

## **3) Nanotechnology for Solar Energy Utilization**

Instructor(s)-in-charge: Prof. HE Tao

Because of concerns regarding energy security, environmental crisis, and the rising costs of fossil-fuel-based energy, there has been significant, resurgent interest in utilization of solar energy recently due to its clean nature and abundance of the source. Unfortunately, the utilization efficiency is still pretty low, which dramatically limits the wide use of solar energy. Nanotechnology may afford a solution to this. Thus, the major goal of this course is to provide the students general concepts and state-of-the-art developments in the field of nanotechnology for solar energy utilization.

#### **4) Functional Nanostructure: Synthesis, Characterizations and Device Applications**

Instructor(s)-in-charge: Prof. HE Jun& Prof. WEI Zhixiang

This course includes three sections: inorganic semiconductor nanostructures, organics functional nanostructure and characterization of nanomaterials. The first section provides atoms-to-device introduction to the latest semiconductor quantum heterostructures. It covers nanostructures growth, their electronic, optical, and transport properties, their role in exploring new physical phenomena, and their utilization in devices. For the second part, by studying of this section, student should know the history and principles of organic electronics, understand how to use various strategies to produce organic functional nanomaterials, get the ideas how to construct organic electronic and optoelectronic devices, including filed effect transistors, light emitting diodes, and photovoltaics. The third provides Electron microscopic characterization of nanomaterials, Spectroscopic characterization of nanomaterials and some latest applications of nanomaterials.