

**University and PG College  
College Teachers  
Training Program  
in  
Chemistry**

**19 June to 9 July, 2017 (21 days)**



**Center of Excellence in Science and  
Mathematics Education**

**Indian Institute of Science**

at its

**Challakere Campus, Chitradurga-577536**

Under

**Pandit Madan Mohan Malaviya National  
Mission on Teachers and Teaching  
(PMMNMTT), MHRD, Govt. of India.**



The IISc at Challakere Campus offers a great opportunity for University and PG college teachers teaching MSc Chemistry. This is a three weeks residential training program equivalent to UGC

refresher courses approved by MHRD, Govt. of India.

**Course Specialization: Quantum Chemistry and Solid State Chemistry.**

Unique features of this program are: **LEARN** Solid State Chemistry by doing **EXPERIMENTS** and learn **Quantum Mechanics** by calculating **Electron Energies and Geometries** of molecules and solids employing Density Functional Theory in a Lap-Top with open source Quantum Espresso program; Compare the energies obtained by theory with experiments from photoelectron spectroscopy.

There will be over **80 hours of lecture and 100 hours of experiments on the following topics:**

The course is divided into three parts:

**Part I: Orientation to modern chemistry:** Essential Electronics for Chemists; Essential basic Mathematics for Chemists; Computer Education for plotting routines, plotting mathematical functions, black body radiation-Planck's equation verification, atomic spectra of H, He, Na, Li, and term symbols determination, Rydberg constant, electromagnetic spectrum; plotting Planck, Maxwell, Fermi, Bose - Einstein distribution functions, plotting s, p, d, f and hybrid orbitals; Energy levels - atomic spectra and molecular spectra; Chemical reactions- experiments; Unix Operating system to run DFT calculations. ( 6 days).

**Part II: Quantum Chemistry-** Basics of quantum Mechanics, Exact solution of hydrogen atom; Density Functional Theory to obtain electronic energy levels in atoms, ions, molecules, transition metal complexes; Determination of crystal structure and electronic structure of metals and semiconductors by DFT, bands in metals and semiconductors (8 days).

**Part III: Solid State Chemistry- (8 days)** Introduction to solid state chemistry, Packing in solids, metals, ionic solids, determination of structure by x-ray powder diffraction of metals, semiconductors and oxides belonging to cubic system, preparation of metallic thin films and determination of their structures, low temperature

preparation of oxide materials and study of their properties including their structure and magnetism. We have designed experiments on the above topics to learn theory. Each day, teachers will be doing 3 to 5 experiments. Experiments include: Resistance vs Temperature for metals and semiconductors (SC), measurement of band gap; Temperature measurements from 77 to 1000 K; X-ray diffraction, determination of lattice parameters and Miller Indices, Rietveld refinement of XRD profile, TGA, Langmuir adsorption, vacuum techniques, gas-solid reaction kinetics, CO oxidation, NO reduction, temperature programmed reduction, gas chromatography, IR, UV and NMR spectroscopy of representative solids.

Teachers can have individual or project mode training depending on the interest and competence.

Applications are invited from Indian Citizens who teach Chemistry to MSc students from any part of India. Those who have attended two UGC refresher courses earlier can also apply. **Contract Lecturers and guest faculty members can also apply.**

***Send your application mentioning***

1. Name, Address, E-mail & Phone No.
2. Date of Birth
3. Qualification with affiliating Institution/College
4. Place of work & Experience and specialization
5. Endorsement by Principal/Head of Institute.

**Last date to receive application:  
May 15, 2017**

**Send your application to**

**Dr. Vasudev Bhat**

**Coordinator - Chemistry**

**TDC, IISc Challakere Campus – 577536**

**Phone No: 9445485270**

**E-mail: bhatvasudeva2015@gmail.com**

**For more details please visit**

[tdc.iisc.ernet.in](http://tdc.iisc.ernet.in)