Functional Materials

Overview

The purpose of this course is to introduce the principle of functional materials through the role of the material structure. The main objective is to teach the students about properties of materials in order to understand the principle behind advanced material. This course should be viewed as introductory survey of principles in advanced functional materials and their applications. The course is divided into parts based on the various material properties. Initially the students will learn about the crystal structure of solids, phase transformations and relations between crystal structure and functional properties and material synthesis and processing of functional materials.

Further, insight into applications of semiconductors in electronics, optics and photovoltaic cells, ionic conductors in batteries, sensors and fuel cells will be given. The course will continue with the discussions on materials for energy technology, applications of polar materials such as magnetic, dielectric, electronic and optical materials with emphasize on their ferroic representatives such as ferro- and piezoelectric materials.

Course participants will learn these topics through lectures and tutorials. Also case studies and assignments will be shared to stimulate research motivation of participants.

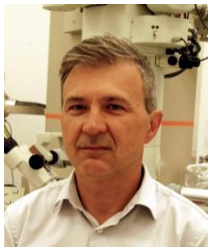
Objectives

The students will gain knowledge and skillets of:

i) Exposing participants to structure and properties of a broad spectrum of functional materials.
ii) Explain with the help of band structure model the characteristics and the applicability of functional materials, especially regarding semiconductors.
iii) Explain the principles of magnetic, optical and electric properties of materials, and can give specific examples of materials and applicability.
iv) Show insight in some examples, which are discussed during the course, on developments of new materials with special properties and potential applicability of these in the future

Modules	**November 16 – November 21, 2020 (6 days)** 11 hrs lectures and 10 hrs Tutorials **Number of participants for the course will be limited to fifty.**
You Should Attend If…	• Student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic/technical institutions and Universities. • Researchers from government organizations including R&D laboratories.
Fees	The participation fees for taking the course for all modules is as follows: **Academic Institutions: (Within India)** BTech/MSc/MTech Students: Rs. 1,500/- PhD/Post-Doctoral Fellows: Rs. 2,000/- Faculty/Researchers/Scientists/Staff from Academic Institutions): Rs. 4,000/- Industry/Research Organizations: Rs. 7,000/- **Participants from abroad:** US: $ 500/- The above fee includes all instructional materials, computer use for tutorials, 24 hrs free internet **Facility. The participants will be provided with accommodation on payment basis.** Last Date to Apply: May 18, 2020
Mode of Registration	All prospective participants need to do web registration for the course on GIAN (http://www.gian.iitkgp.ac.in/GREGN) portal. After the mandatory web registration, participants should share the registration details with course coordinator by email (mkumar@iitj.ac.in). The shortlisted participants will be informed by email to register for the course by making full payment of the course registration fee.

The Faculty



Prof. Matjaz Valant graduated from University of Ljubljana, Slovenia in 1996 with a PhD degree in Chemistry. He did his postgraduate research at University of Pennsylvania, USA, and continued the research at Jozef Stefan Institute in Slovenia. From there, he moved to UK, where he worked at London South Bank University and Imperial College London. In 2009 professor Valant established Material Research Laboratory at University of Nova Gorica. Today, the laboratory, with its more than 5 MEUR infrastructure and an annual budget of around 1 MEUR, employs 18 researchers of different seniority, expertise and nationalities. Within the laboratory he established a group for theoretical material science, surface science, materials chemistry and the Electron Microscopy Center. In his career he was a visiting professor at London South Bank University and Imperial College London while now is an adjunct professor at University of Electronic Science and Technology of China. His main research interest are materials and technologies for sustainable energy, (photo)catalysts, topological insulators, electrocaloric materials as well as other nanostructured functional materials He has published over 180 scientific papers (H-index 42) and collected > 6000 citations. He is an author of 14 patents.

Dr. Mahesh Kumar is an Associate Professor in the department of Electrical Engineering, IIT Jodhpur. He has received M.Sc degree in Physics from University of Rajasthan, M.Tech degree in Solid State Materials from IIT Delhi and Ph.D degree in Engineering from IISc Bangalore. He worked at Central Research Laboratory of Bharat Electronics Ltd. (CRL-BEL) Bangalore as Scientist from 2005 to 2013. He has also worked at University of Paderborn Germany through INSA Bilateral Exchange programme and South Dakota State University through prestigious BASE Fellowship supported by IUSSTF. His research interests are focused on 2D materials, Functional Materials, Solar Cells, Sensors, Semiconductor materials and devices. He has received INSA Medal for Young Scientists-2014 by Indian National Science Academy and the MRSI Medal-2016 by Materials Research Society of India. He has published more than 100 research articles

Course Co-ordinator

Dr. Mahesh Kumar
Department of Electrical Engineering
Indian Institute of Technology Jodhpur
NH-62 Nagaur Road Karwar
Jodhpur-342037
Phone: 0291-2801357
E-mail: mkumar@iitj.ac.in

.....

http://www.gian.iitkgp.ac.in/GREGN